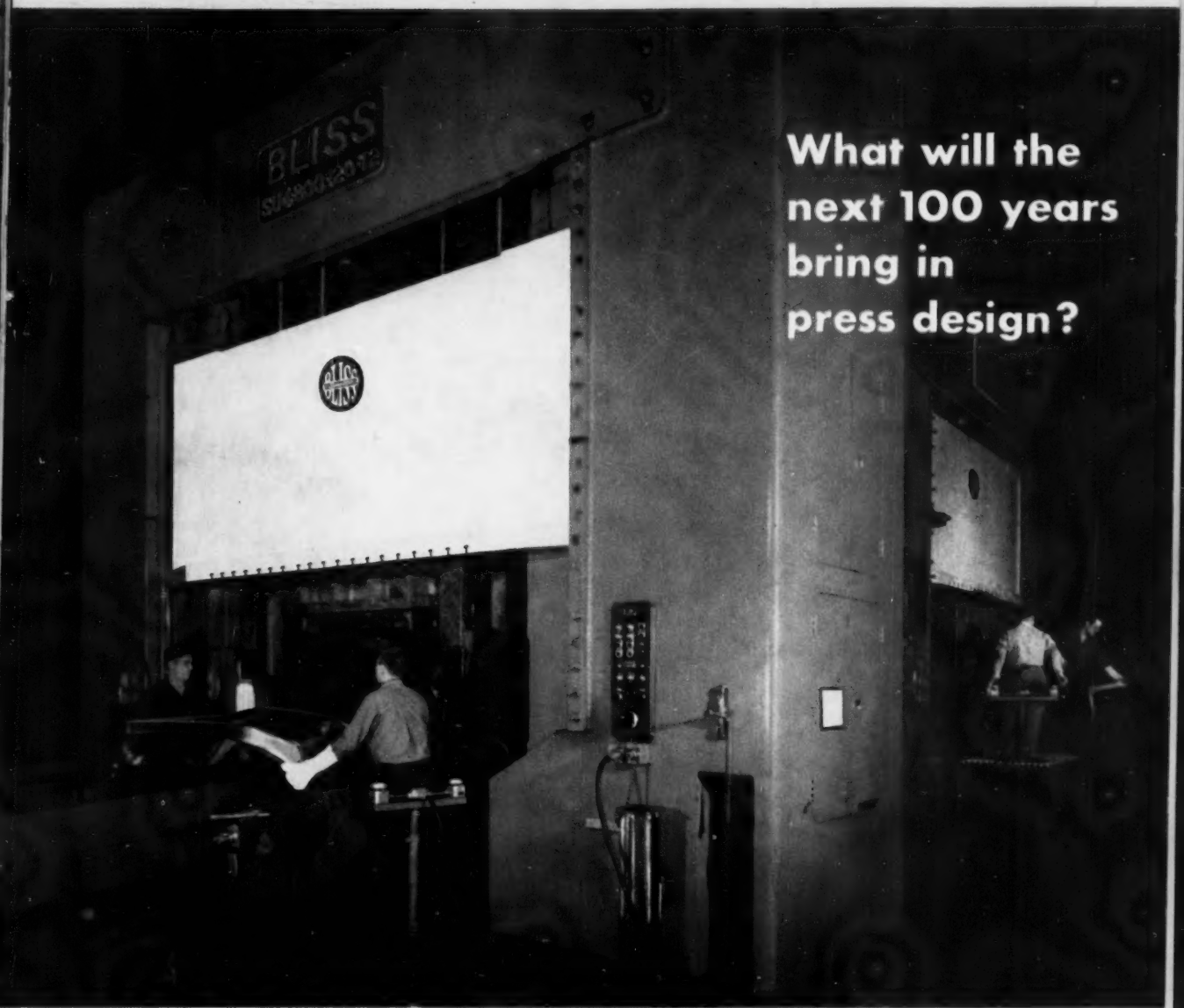
February, 1957

Machinery

Road-Building Equipment Number



THE LAST WORD in a century of progress in press design are these ultra-modern eccentric underdrive presses at Ford's Walton Hills, Ohio plant. Designed on the verge of Bliss' 100th Anniversary, they are a clue to what the next hundred years will bring.

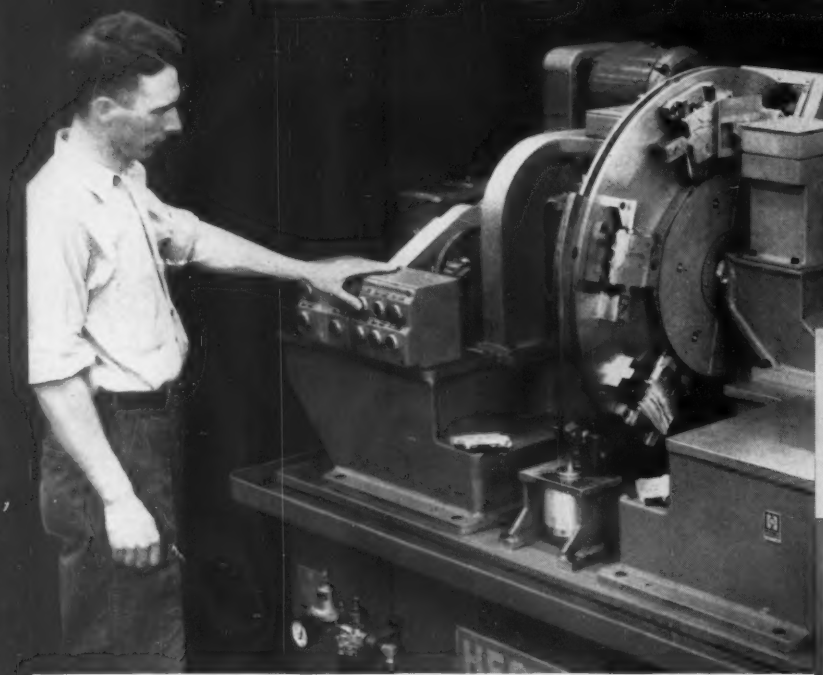
Notice how clean, how sleek they are. All air cylinders, electricals, power controls, piping and wiring are contained *within* the housing. Putting them within the uprights speeds installation—makes them virtually "plug-in" presses—and makes it easier for cranes to move in fast and close to load and unload dies.

To keep up with Ford's production, the presses are fitted out with new recirculating oil lubricating systems, extra long gibs and pull-downs, motorized slide adjustments, and a host of other features that mark them as the latest in press design... as the curtain rises on Bliss' second century.

E. W. BLISS COMPANY, Canton, Ohio

BLISS
SINCE 1857
100
years of making metal work for mankind

LET'S FACE IT!



This special Heald Bore-Matic, with 12-station trunnion type fixture, is designed for precision facing of aluminum automatic transmission valve bodies. Two parts precision faced simultaneously on opposite sides of the fixture. The fixture rotates at approximately ⅓ rpm and finished parts are unloaded and new parts loaded manually during a 60 degree segment of fixture rotation. With stock removal of .05 inch over the face area and a surface finish of 20 micros or better, this "ferris wheel" Bore-Matic maintains a continuous production of 270 parts per hour at 75% efficiency.

Heald "Ferris Wheel" Bore-Matics put precision facing on a non-stop, high production basis . . . with loading and unloading "on the fly"

WHEN it comes to *precision facing*, Heald Borizing, with a "ferris wheel" type fixture, meets the most exacting requirements for both high production and high precision.

Designed for continuous operation, with non-stop loading and unloading, a multi-station rotating trunnion-type fixture carries the parts between two opposed boringheads which perform simultaneous facing operations on both sides of the fixture.

The loading and unloading are done while the fixture is rotating at a constant speed and can be accomplished easily by manual operation as in the photo above. A foot operated hydraulic clamping control leaves both hands free for this operation.

This specialized precision facing machine illustrates the extreme flexibility of Bore-Matic design and the ability of Heald engineering to solve your precision finishing problems with the most advanced production methods.

IT PAYS TO COME TO HEALD!

HEALD®

THE HEALD MACHINE COMPANY

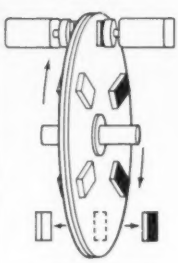
Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

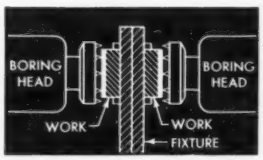
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Heald "ferris wheel" Borizing is adaptable to a wide variety of precision facing operations.

BORIZING

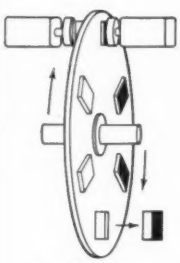


LOADING STATION

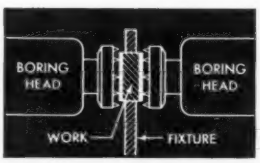


FACING ONE SIDE OF TWO PARTS SIMULTANEOUSLY

BORIZING

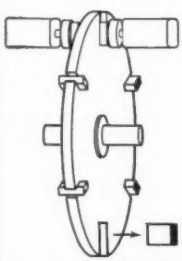


LOADING STATION

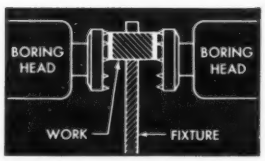


FACING BOTH SIDES OF ONE PART SIMULTANEOUSLY

BORIZING



LOADING STATION



FACING BOTH ENDS OF ONE PART SIMULTANEOUSLY

See also pages 100 and 101.

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Machinery

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The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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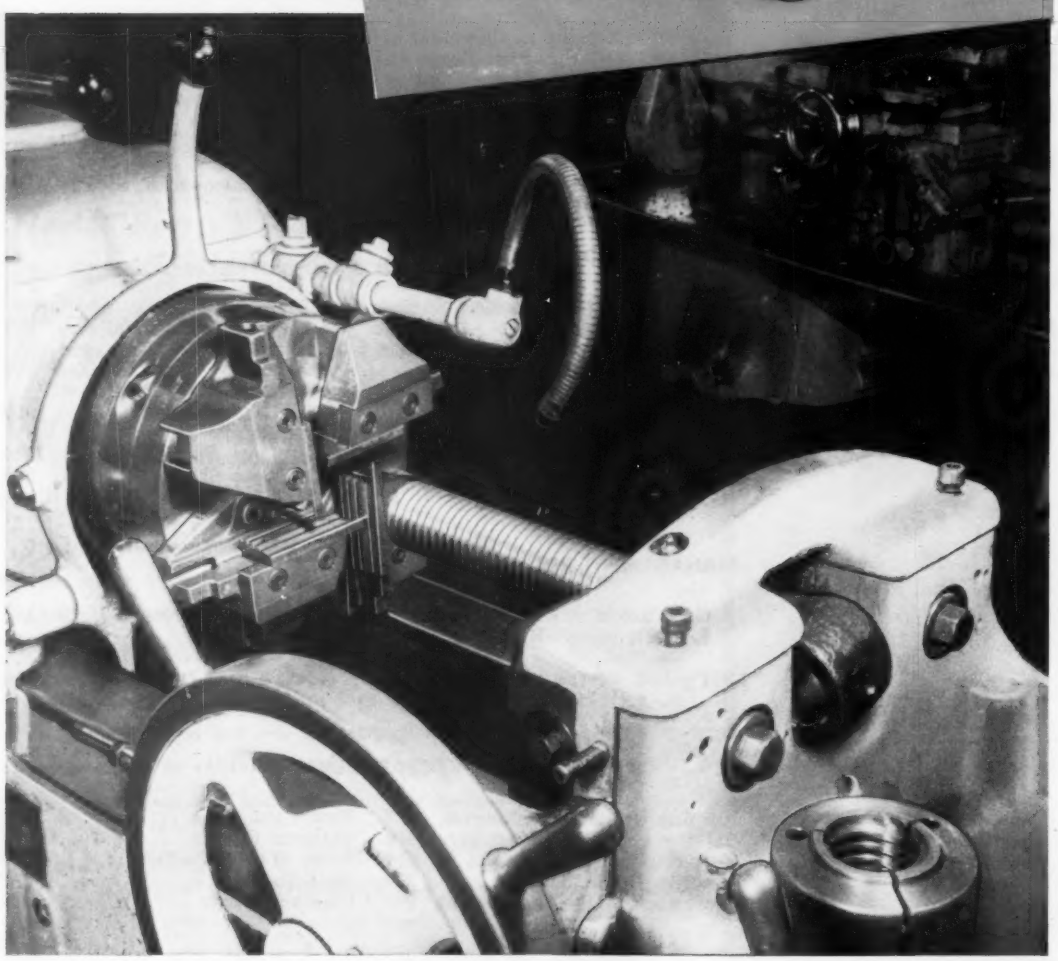
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461-C -2

coarse threads

cut in one pass

with LANDMACO machines

The cutting of large diameter Acme threads at the Iowa Manufacturing Co. of Cedar Rapids, Iowa, illustrates the heavy duty threading possible on LANDMACO Threading Machines.

1045 steel forgings of 20-29 Rockwell C are used in the production of adjusting screws for construction equipment. 2¼"-3 pitch Special Acme threads (EXTRA DEEP) are cut 10" long, with a .026 pitch diameter tolerance and a .001 per inch allowable lead error.

Cutting at a speed of 7.6 surface feet per minute, 12.5 pieces are completed per hour. This includes 100% gaging on the machine, using go-and-no-go gages. Despite the large amount of metal removal, at least 80 pieces are produced between chaser grinds.

This job is an excellent example how such heavy-duty threading can be done with the LANDMACO Machine. The 2½" Single Spindle Machine (½" to 2½" range) used here features heavy construction, hardened-and-ground ways, lead screw attachment, and is equipped with a rugged LANCO Tangential Chaser Die Head. Roughing-and-Finishing Centering Throat Chasers produce heavy cuts in one pass of excellent finish, eliminate the out-of-roundness common in long heavy workpieces, and provide low tool cost.

LANDMACO Machines offer precision and heavy duty threading within a range of #4 to 4" in diameter. For more detailed information, please send specifications when writing.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

LANDIS Machine COMPANY

WAYNESBORO
PENNSYLVANIA

POWER to build delivered





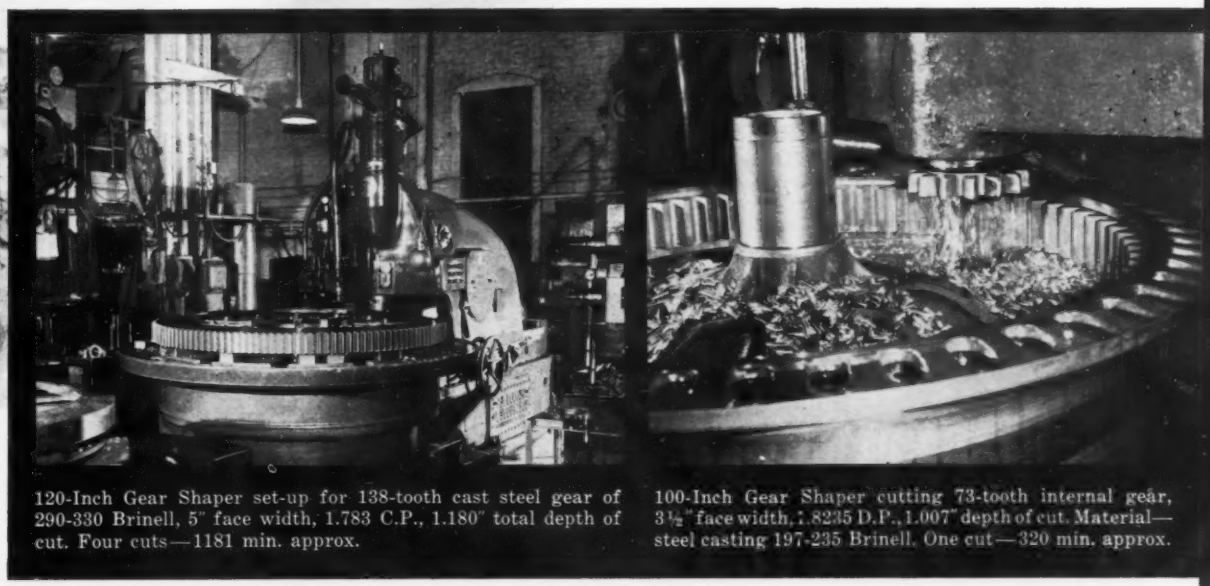
Lorain-56 Shovel-Crane is 1¼ yard shovel, 25-ton crane, or 30-ton crane as desired, features torque converter to absorb working shocks and stresses, 2-lever air controls for easier operation.

Lorain Moto-Cranes* combine speed, power and versatility available in a range of lifting capacities from 7 to 75 tons. Multiple speed transmission, multiple big tires provide exceptional off-road mobility.

THE PRECISION LINE Fellows

*Reg. U.S. Pat. Off.

America's Highways...
by FELLOWS-CUT GEARS



120-Inch Gear Shaper set-up for 138-tooth cast steel gear of 290-330 Brinell, 5" face width, 1.783 C.P., 1.180" total depth of cut. Four cuts—1181 min. approx.

100-Inch Gear Shaper cutting 73-tooth internal gear, 3½" face width, 1.8235 D.P., 1.007" depth of cut. Material—steel casting 197-235 Brinell. One cut—320 min. approx.

The machines that move mountains of material for America's highway programs demand good, rugged, smooth running gears that will transmit, without failure, the many tons of force required.

The well known Thew Shovel Company of Lorain, Ohio is one of the major construction equipment makers that use Fellows machines to produce these gears. The largest Thew-Lorain gears require the largest capacity Gear Shapers in the Fellows Line, the 100-Inch and the 120-Inch.

These two Gear Shapers are designed to take heavy cuts at coarse feeds on spur or helical gears. Capacities: 28" to 100" for externals and 46" to 100" for internals on the 100-Inch; 28" to 120" for externals and 46" to 120" for internals on the 120-Inch. Maximum face width on each is 8".

For *full* information about the complete Precision Line of cost-cutting Fellows Gear Production Equipment get in touch with your Fellows representative. Write, wire or phone any Fellows office.

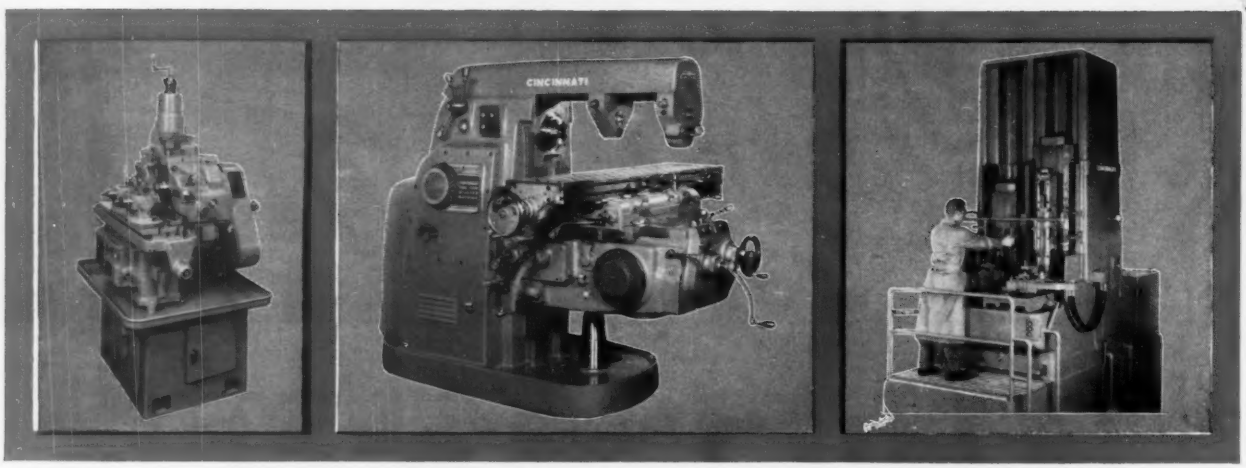
THE FELLOWS GEAR SHAPER COMPANY
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Gear Production Equipment

Outlook for Cost of Production

Your Costs Can be Sharply Reduced with....

Cincinnati Engineering Service
Cincinnati Milling and Broaching



CINCINNATI O-8 Plain Automatic Milling Machines ...are built with automatic rise and fall spindle carrier (as illustrated) and without this feature. There are 16 table feeds, ½" - 20", 1" - 40" or 2" - 80" per minute; table has 400" per minute rapid traverse; 20 spindle speeds, 80 to 3000 rpm. Complete operating cycle functions automatically, started with one lever. Want more information? Write for catalog No. M-1607-2.

CINCINNATI Dial Type Milling Machines . . . are heavier and more powerful than ever before. All sizes (Nos. 2, 3, 4) are available in Plain, Universal and Vertical styles. 24 spindle speeds; 32 feeds, ⅜" - 90" per minute. All are equipped with Automatic Backlash Eliminator; power speed and feed changes at front and rear operating positions; Dynapoise overarm; motor driven cutting fluid pump; feed drive motor mounted on the knee; push-button spindle speed change and spindle start-stop. Plain and Vertical Machines are available with or without Automatic Table Feed Cycles. Complete specifications may be obtained by writing for catalog No. M-1915-1.

CINCINNATI Vertical Hydro-Broach Machines . . . handle an ever-increasing variety of high production work accurately and economically. Built in single ram and duplex (illustrated) styles, both have automatically receding tables, timed with reversal of ram movement. Ways are hardened and ground, automatically lubricated. Broach holders are interchangeable. There are seven sizes of each style, Nos. 1-30 to 10-66. Catalogs No. M-1745 for the Single Ram; No. M-1848 for the Duplex.

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

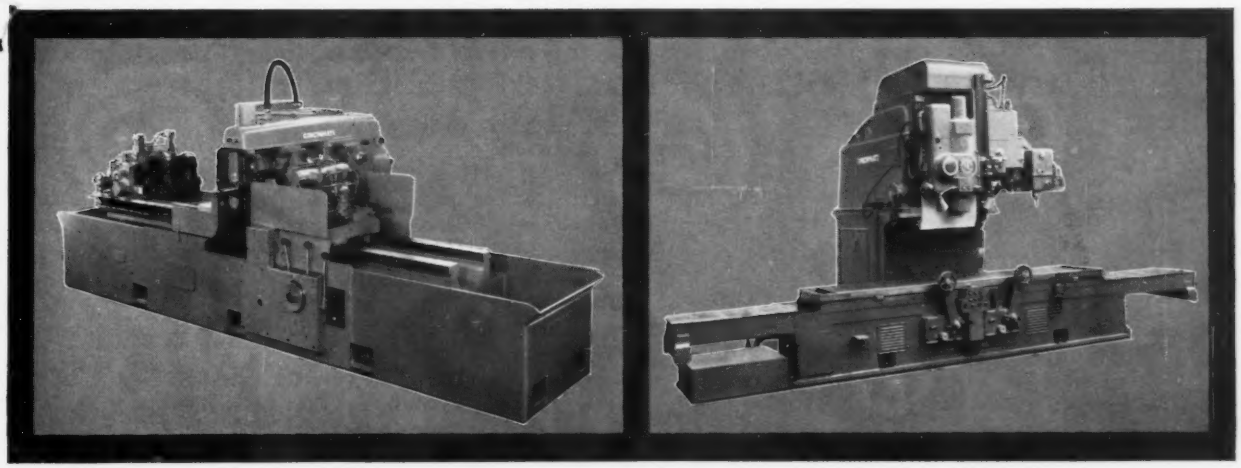
This Year!

CINCINNATI

and New Machines

Your excess production costs can be accurately determined by comparing the performance of your present metalworking equipment with new CINCINNATI® Milling and Broaching Machines. You'll be agreeably surprised at the big savings you can make in production costs and maintenance charges . . . and at the closer precision obtained. Cincinnati's Engineering Service can help you apply the correct method, tooling and machine for your work. This engineering "know how" combined with a wide range of types and sizes of CINCINNATI Milling and Broaching Machines, gives you an opportunity to forecast a much better outlook for your business. Why not get in touch with us today. For brief specifications of the machines illustrated and the many other sizes and types available, look in the latest issue of Sweet's Machine Tool File, or write for our new general catalog, publication No. M-1961.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI HyPowermatic Plain and Tracer Controlled Milling Machines . . .
for heavy duty production milling operations are built in Plain (illustrated) and Duplex styles and 42 sizes of each from 36" to 168" table traverse; up to 50 hp spindle drive and separate 5 hp feed drive; built-in Backlash Eliminator. Tracer controlled machines combine heavy duty tracer controlled milling with all the conventional milling operations assignable to Plain and Duplex HyPowermatics. Simple sheet metal templates are attached to the fixture or table. Profiles having curvatures and straight lines at angles up to 80° from the horizontal can be accurately milled. Want more information about the HyPowermatics? Complete specifications may be obtained by writing for catalog No. M-1909-1.

CINCINNATI 30" Vertical Hydro-Tel Milling Machine . . .
for shops requiring large, rangy vertical millers having 20 hp spindle drive. Can be equipped for die sinking and/or profile milling. Power feed rates infinitely variable. Power changes of spindle speeds with selector switch and dial type speed indicator. All controls are conveniently grouped at the front of the machine, and easily reached from operating position. Available in three bed lengths to provide table travel of 60", 96" or 120". Catalog No. M-1923-1.

CINCINNATI

HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

For more information fill in page number on Inquiry Card, on page 239

VAN NORMAN

No. 4BG1 Bowgage Production Grinder

10 Tons of Massive Rigidity

for Extra Precision, Performance and Economy in Mass Production Grinding

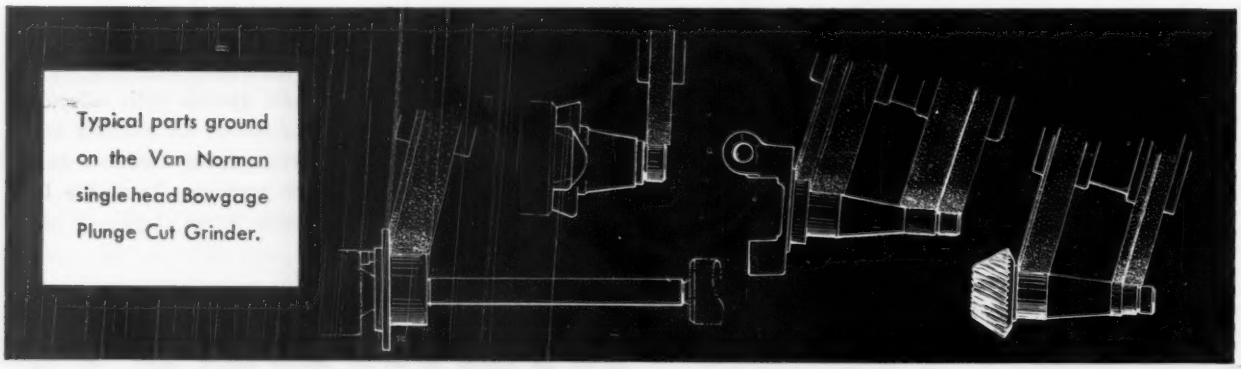
The No. 4BG1 Bowgage plunge cut grinder was developed for a leading automotive manufacturer for grinding pinion shafts. This 10 ton brute assures extreme accuracy and increased production by 50%.

Van Norman production grinders feature the exclusive Van Norman Bowgage wheelheads.

These rugged heads are completely self-contained grinding units with feed-back gauging, size compensation, and exclusive diminishing feed, and automatic cycling. By simply taking one or more Bowgage wheelheads and mounting them on a suitable base, there is practically no limit to the number of diameters, tapers, shoulders, etc. that can be ground to close tolerances automatically. Automatic size control to .0002″ plus multiple step contour grinding can assist you to increase production, cut grinding costs. Formed dressed wheels can be profiled to accomplish step grinding for as many as 6 diameters at one time.

Specialized application in precision grinding for mass production can be designed into single or double head grinders to fit your particular requirements.

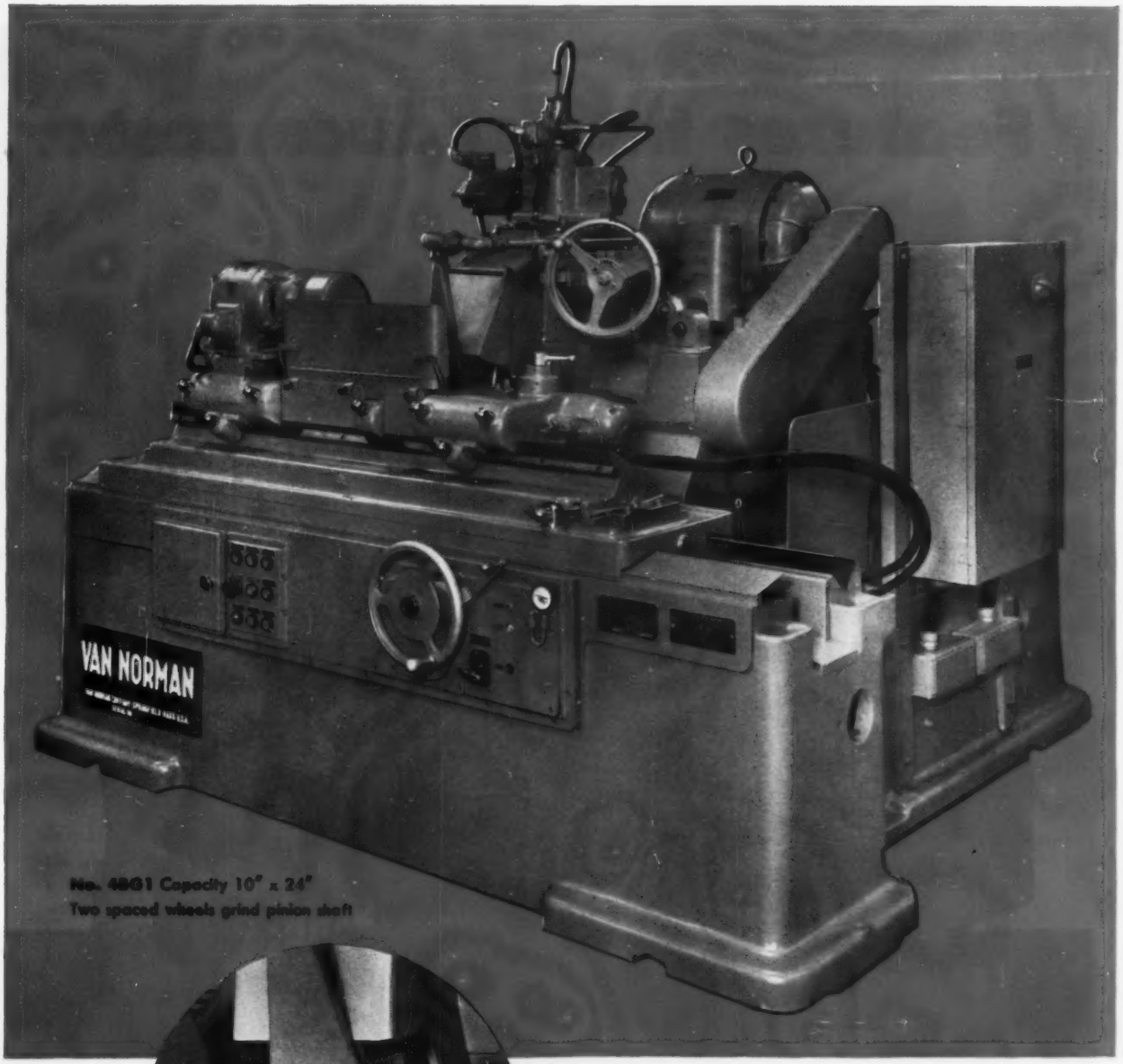
Write for catalog or engineering assistance.



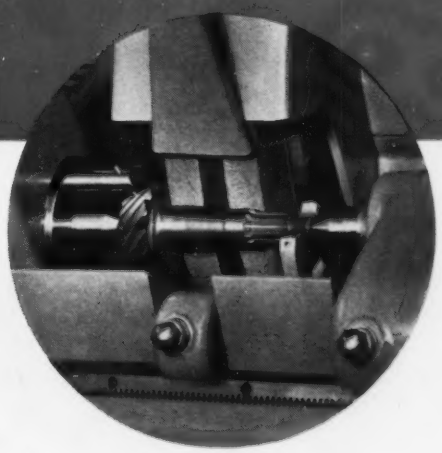
Typical parts ground on the Van Norman single head Bowgage Plunge Cut Grinder.

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



No. 48G1 Capacity 10" x 24"
Two spaced wheels grind pinion shaft



Don't wait . . . for extra profits install a Van Norman Machine now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years . . . See your dealer or write Van Norman Machine Company.

Conditional Sales Contracts not available to Export.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For more information fill in page number on Inquiry Card, on page 239

Features that reduce cost . . .

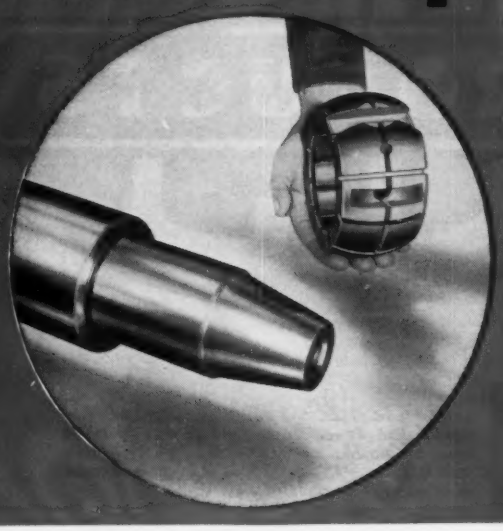


Landis 10" x 36" Type CH Plain Grinder

LANDIS

precision grinders

increase operator output





FAST STOCK REMOVAL

"Rigidized" Microsphere bearings and spindles increase production by heavy cuts without loss of finish and accuracy. A Landis exclusive.

SETUP TIME REDUCED

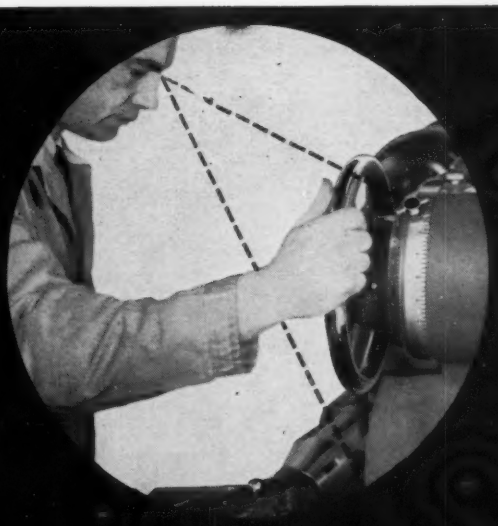
Centralized controls speed setup to give more production time. Controls handy for operator save motion and reduce fatigue.

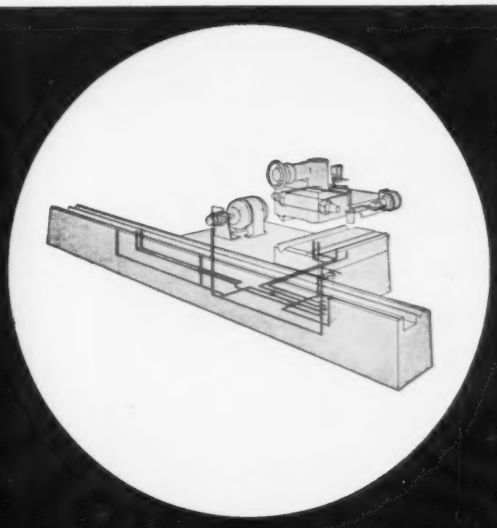
EYE LEVEL WHEEL FEED

The wheel feed is at eye-level—Easy for operator to watch grinding and wheel feed graduations without moving.

PROTECTED LUBRICATION

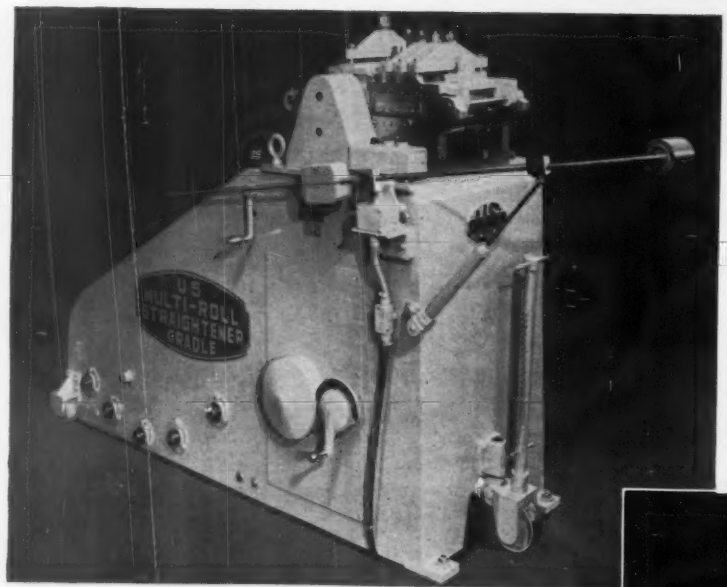
Automatic spindle and way lubrication for dependable operation and machine protection. This is a schematic diagram.





LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

Use U S PRODUCTS

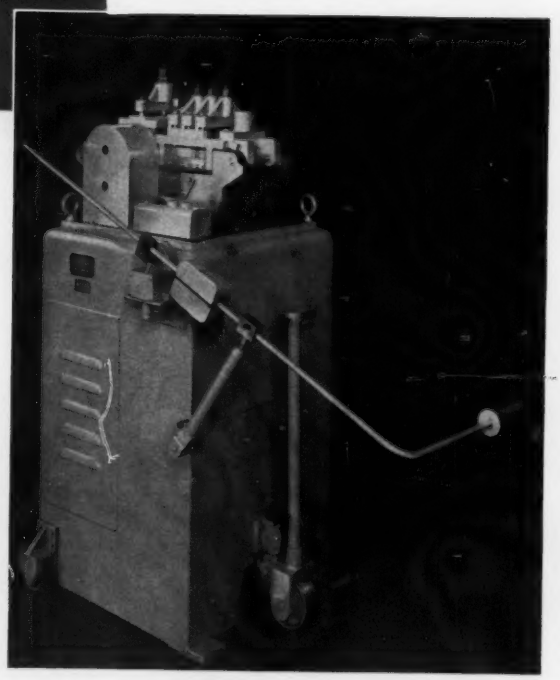


Left: Model PDSC-940 U. S. Combination Coil Cradle and Power Driven Straightener (portable type) for material up to 9" wide, 1/8" thick, coils with O.D. up to 40". Includes 2 H.P. variable speed drive motor. Also made in other sizes.

Below: Model PDS-4 1/2 U. S. Power Driven Straightener (portable type) for material up to 4 1/2" wide by 1/8" thick. Equipped with 1/2 H.P. variable speed drive motor. Also made in other sizes.

Opposite page, left: Model SF 24-24 U. S. Mechanically Driven Slide Feed with Plain Straightener for material up to 24" wide, mounted on a Straight Side Press.

Opposite page, right: Model SF 12 U. S. Mechanically Driven Slide Feed with Plain Straightener for material up to 4 1/2" wide, mounted on a Minster High Speed Gap Press.



★ U. S. PRODUCTS

Slide Feeds
Roll Feeds
Stock Straighteners
Stock Reels
Stock Oilers
Coil Cradles
Wire Straighteners
Die Sets
Multi-Slides®
Multi-Millers®

—Reduce Pressroom Costs!

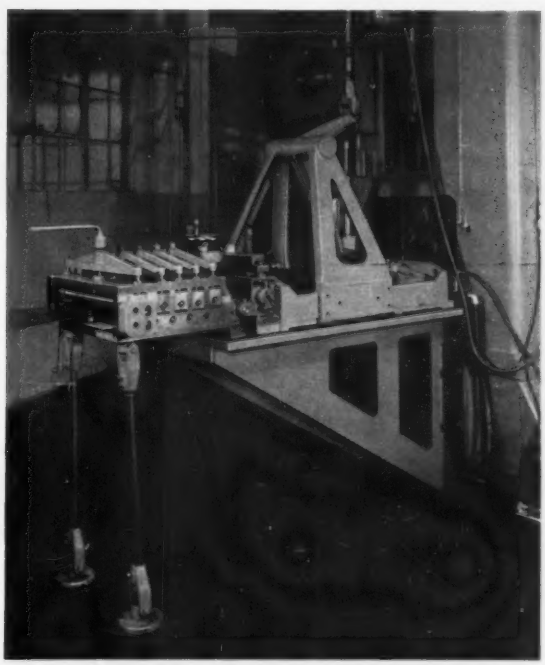
Don't allow inefficient operations to devour your profit margin. U. S. Automatic Press room Equipment is designed and built to help you effect savings in the production of stampings.

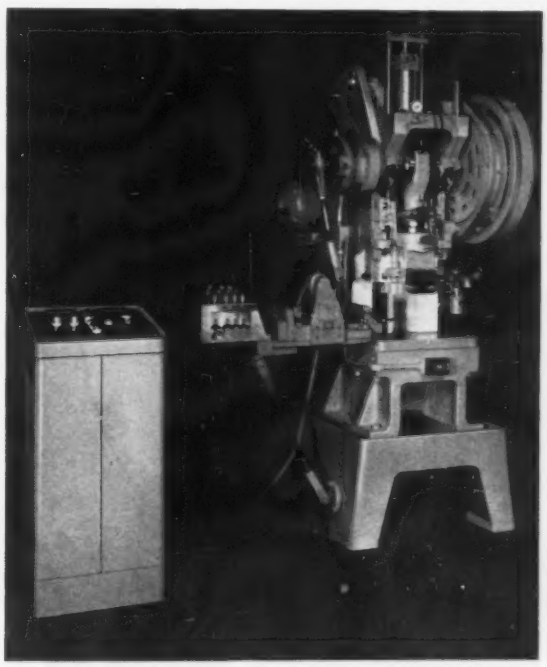
The use of coil stock in your punch press operations should result in very definite savings, and these savings can only be completely assured by using automatic equipment in conjunction with your presses. The illustrations show just a few of the many different units included in the U. S. line for the efficient feeding, straightening and holding of coil stock.

Investigate to see if you are effecting all the cost reductions possible in your press room operations. Ask for a copy of Bulletin 80-A.

U. S. TOOL COMPANY, Inc.

Ampere (East Orange) New Jersey





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see what America's most modern power



SHEAR USERS EVERYWHERE TELL THEIR STORIES OF NIAGARA BENEFITS

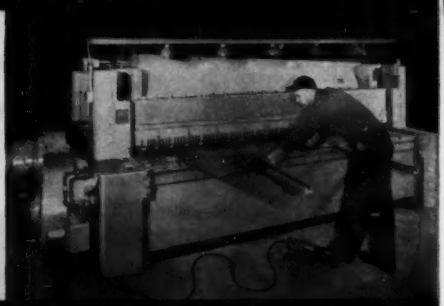
(3 of 19 Photo-Reports shown in Niagara's new Bulletin 69G)



"an exceptional machine value"
—World's Largest Trailer Mfr.



"For over 10 years . . . we have never had any downtime for repairs and maintenance."
—V-Belt Pulley and Caster Mfr.



"High quality of accuracy with the utmost in speed and performance"
—Midwest Road Machinery Mfr.



NIAGARA

squaring shears can do for you!

Speed that spells peak productivity! Accuracy for cutting within micrometer tolerances! Ruggedness to stand the gaff on stiffest assignments! They're all yours with a Niagara Power Squaring Shear. New, fact-filled 74-page Bulletin is profusely illustrated to show you how and why:

From mass producers, fabricating plants, steel warehouses and sheet metal shops comes written evidence of the superiority of Niagara Underdrive Squaring Shears on jobs of every description. *No other shear can match Niagara's record for cutting accuracy, speed and downright economy of operation.*

For a photo story of the many tangible ways in which a Niagara Power Squaring Shear can boost hourly output, improve quality and slice maintenance costs in your plant, make sure that you receive Niagara's newly-published Bulletin 69G by mailing the coupon below. Presenting the greatest shear story ever told this 74-page document will give you a close look at Niagara Shears in numerous applications . . . the *closest* look you have ever had at *any* shear, next to having it on your own floor! It will show you feature-by-feature why a Niagara Shear is far ahead at every point of comparison . . . and why it pays to look to America's oldest leading shear manufacturer for the most profitable answers to *your* requirements.

NIAGARA-DEVELOPED FEATURES PROVIDE THE ULTIMATE IN MODERN SHEAR PERFORMANCE

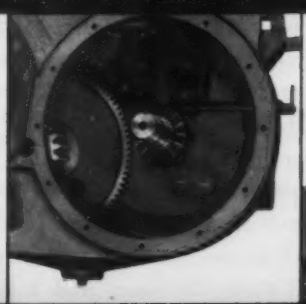
(Here's a glimpse at just a few of many. See them ALL in new Niagara Bulletin 69G)



Fully Closed Box Type Construction



Massive Bed Designed for Super Strength



Instantly Engaging Multi-Jaw Clutch



Powerful, Self-Compensating Holddown

YOURS FOR THE ASKING...

the most comprehensive shear bulletin ever published!

Months in preparation, this fact-filled bulletin now gives you valid, inside facts on the nation's top line of power squaring shears. 74 pages! 141 revealing photographs and illustrations! Specifications for nearly five dozen standard models! Capacities: 16-gage to 1" mild steel. Cutting lengths: 4 to 20 ft. Make sure that you receive a copy at once. Mail the attached coupon today.



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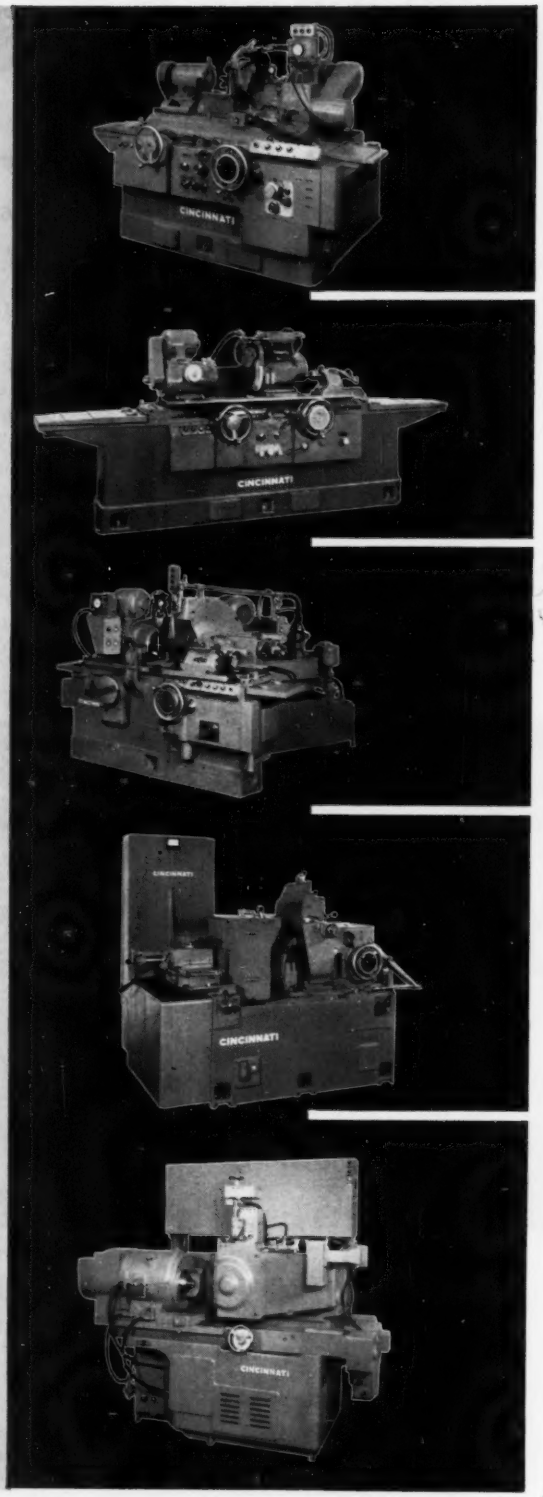
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PRECISION PLANNING GUIDE for '57



Want to take some of the work out of your methods and equipment planning for the coming months? Let Cincinnati Engineering Service apply the newest and most advanced methods to your production grinding requirements. Cincinnati's complete line of precision centertype and centerless grinding machines gives you a choice of equipment to fit your individual needs. Five typical CINCINNATI® FILMATIC Grinding Machines are illustrated here. Of course, there are many more. In all, over 150 sizes of Plain, Universal and Roll Grinding Machines; six Centerless Grinders from 5 to 75 hp; Chucking and Micro-Centric Grinders; Surface Grinder; and special grinding machines. For brief specifications, look in the latest issue of Sweet's Machine Tool File. Or, if you don't have a copy, write for our new general catalog, just off the press, No. M-1961.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

plain centertype grinding; manual or automatic infeed grinding; automatic electric gage sizing, if desired; readily automated.

CINCINNATI FILMATIC Plain Hydraulic Grinding Machines of the type illustrated here will be your first choice for the work outlined at the left. There are four sizes: 6"R, 10"L, 10"R and 14"L. They incorporate a number of exclusive cost-reducing features, including FILMATIC grinding wheel spindle bearings and automatic grinding wheel balancing. The following types of production equipment are available: Push-button Automatic Infeed Attachment; Automatic Gap Eliminator; Behind-the-wheel Profile Truing; Automatic Air-Electric Gage Sizing with Cycle Time Stabilizer (as illustrated). Get the complete story in the following catalogs . . . 6"R and 10"L machines, G-660-1; 10"R and 14"L machines, G-661-1.

toolroom centertype grinding, both external and internal; production and toolroom grinding combined.

CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinders are the standard of industry for medium- to large-size toolroom grinding. They are equipped with an internal grinding unit hinged at the front of the wheelhead housing; FILMATIC grinding wheel spindle bearings last a lifetime and require no adjustment; the footstock spindle is chromium plated to prevent wear; headstock speeds are selected with an easy-to-turn dial; rapid cross traverse feature available. A smaller machine, the *10" Universal*, may be equipped for production infeed and shoulder grinding. Catalog No. G-663 for the 12", 14" and 18" machines; catalog No. G-577-5 for the 10" machine.

automatic diameter and shoulder grinding in unison; automatic electric gage sizing, manual or automatic flagging devices, if desired.

CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines are tops for precision cylindrical work requiring accurately ground diameters and adjacent shoulders. Both are completed in one automatic infeed cycle. These machines, built in 6"R, 10"L, 10"R and 14"L swing sizes, are equipped with Automatic Grinding Wheel Balancing, FILMATIC grinding wheel spindle bearings and other cost-reducing features. They have plenty of capacity for multiple diameter work. Get your copy of catalog No. G-647-1.

centerless grinding, infeed and thrufeed; variety or high production; short work and bar work; manual or automatic cycle grinding; readily automated.

CINCINNATI FILMATIC Centerless Grinding Machines are without question the finest equipment available for any type of work which can be centerless ground. Additional industries are constantly finding the CINCINNATI Centerless their most profitable precision grinding equipment. And you have the advantage of Cincinnati's 30 years' experience in centerless grinding applications. There are six in the Cincinnati line: No. 0, 2 (illustrated), 3, 4, 5 and 6; 5 to 75 hp. Many attachments available, including hopper feeds, spindle reciprocating, long bar equipment and others. All are included in Sweet's; individual catalogs available.

automatic grinding of short parts which can be held in a chuck; readily automated.

CINCINNATI FILMATIC Chucking Grinders. Of course you'll want Cincinnati for your precision chucking work, for only Cincinnati can give you so many advantages. FILMATIC grinding wheel spindle bearings, an exclusive feature, require no adjustment. Choice of single spindle or two-spindle headstock. Machine mounted cabinet for complete and accessible electrical controls. Made in two sizes: No. 1, capacity 0 to 4" diameter; No. 2, capacity 2" to 10" diameter. Ask for the new CINCINNATI FILMATIC Chucking Grinder catalog No. G-685.

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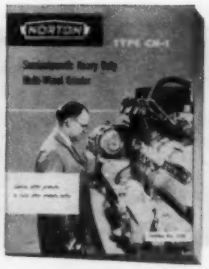
CYLINDRICAL GRINDERS



10" Type CTU and 14" Type LCTU. Semiautomatic or plain. For plunge or traverse operations, from roughing cuts to finest finishing. Can take a wide range of multi-wheel mounts. In production line and job shop work these machines have doubled production, replaced several machines, eliminated extra operations. *Catalog No. 1787*



10" Type CV-4 and 14" Type LCV-4 Angular Wheel Slide. Semiautomatic machines that grind thrust surfaces and adjacent diameters in one fast, automatic plunge operation. They leave a concentric grain pattern in the thrust surface finish, assuring a better seal surface and appearance. *Catalog No. 1658*



Type CM-1 Heavy Duty Multi-Wheel. Semiautomatic. Makes four or more cuts simultaneously, in a single plunge-grind cycle. Brings new speed, accuracy and economy to the grinding of multi-diameter parts. Many automatic features, including one-lever control. *Catalog No. 1550*

ROLL GRINDERS



Type C-2. A heavy duty machine, featuring faster cutting, quicker set-ups, easier operation. Available as a plain, semiautomatic or roll grinder. One-lever control of grinding cycle on the semiautomatic. As a roll grinder it includes the famous Norton tilting wheel head. *Catalog No. 1827*

CAM GRINDERS



NO. 3 CAM-O-MATIC Cam Grinder.* An automatic, hydraulic machine that is setting new standards for production, precision and finish. Grinds all cams and the camshaft eccentric successively and automatically, in one handling. Entire operation geared to split-second efficiency. *Catalog No. 191*

Check these guide books to

bigger grinding profits

Get the facts on how Norton grinding machines can benefit your production

In building the world's largest line of grinders and lappers — including automatic machines and machines for specialized operations — Norton offers you the greatest opportunities to modernize.

A representative selection of Norton machines is listed here, together with their catalogs. It will pay you to send for any catalog that concerns your grinding or lapping operations. Learn how replacing your obsolete equipment with new Norton machines will enable you to meet competition with the best production tools in the field. Learn also, how the Norton Lease and Financing Plans enable you to modernize, yet conserve your capital.

Ask your Norton representative for the literature you want, or write direct. And remember: only Norton brings you such long experience in both grinding machines and grinding wheels — to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

CRANKPIN GRINDERS

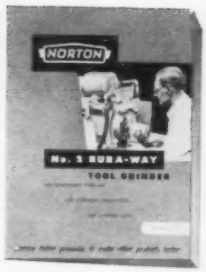


Automatic Transfer Type. For completely automatic crankpin grinding — a news-making Norton *"first."* Locates, grinds, gages, transfers — all automatically — cutting costs on each crankshaft ground. Typical of Norton's rapid progress in automatic operation. *Catalog No. 1837*

CUTTER AND TOOL GRINDERS

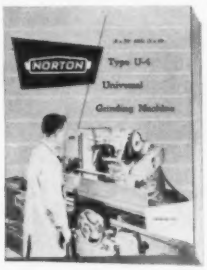


No. 20 Cutter And Tool Grinder. Fastest, most versatile machine in its class. Wheel head tilts 15° above or below horizontal and swivels through 360°, simplifying many difficult grinding jobs. Easy to set up, operate and maintain. *Catalog No. 189*



No. 2 BURA-WAY Tool Grinder.* Unequalled for grinding convex single point and form tools. Generates, produces and maintains relief angles constant in the direction of the feed. Duplicates the master tool form exactly. Extends the life of carbide-tipped and other tools. *Catalog No. 220*

UNIVERSAL GRINDERS

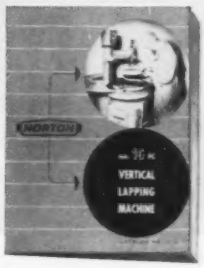


Type U-4, 12" x 36" and 12" x 48". Quick, easy set-ups plus fast grinding action save time and costs on a wide variety of external, internal, face and angular wheelslide jobs. Simply turning a dial gives an infinite number of works speeds over its 40 to 400 rpm range. *Catalog No. 231*

LAPPERS

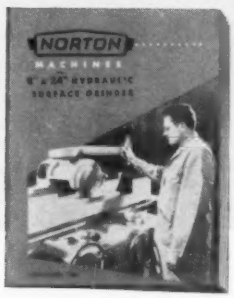


HYPROLAP Lapping Machine No. 48F.* An extremely fast, high production machine for single or parallel face flat lapping. Bonded abrasive laps produce work pieces free of grit. Three arrangements: plain, timed cycle; automatic continuous feed; semiautomatic continuous feed. *Catalog 1954*



Vertical Lapping Machine No. 16FC. Outstanding productive capacity for flat work up to 3" x 5" and cylindrical work up to 3" diameter. Can produce optically flat surfaces and diameter tolerances in millionths, with fine repetitive accuracy. *Catalog No. 212.*

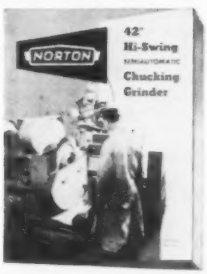
SURFACE GRINDERS



8" x 24" Hydraulic. Grinds plane surfaces speedily and economically, in large stock removal or close tolerance operations. Designed with both hand and hydraulic table cross feed. Convenient controls and easy accessibility reduce operating and maintenance time. *Catalog No. 190*

SPECIAL GRINDERS

42" Hi-Swing Semi-Automatic Chucking Grinder. For rapid, accurate grinding of large diameter, short parts, such as jet engine compressor wheels and similar components. Takes work held by chucks, face plates or special fixtures and permits grinding several surfaces without disturbing the set-up. *Catalog No. 1780.*



*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

To Economize, Modernize with NEW

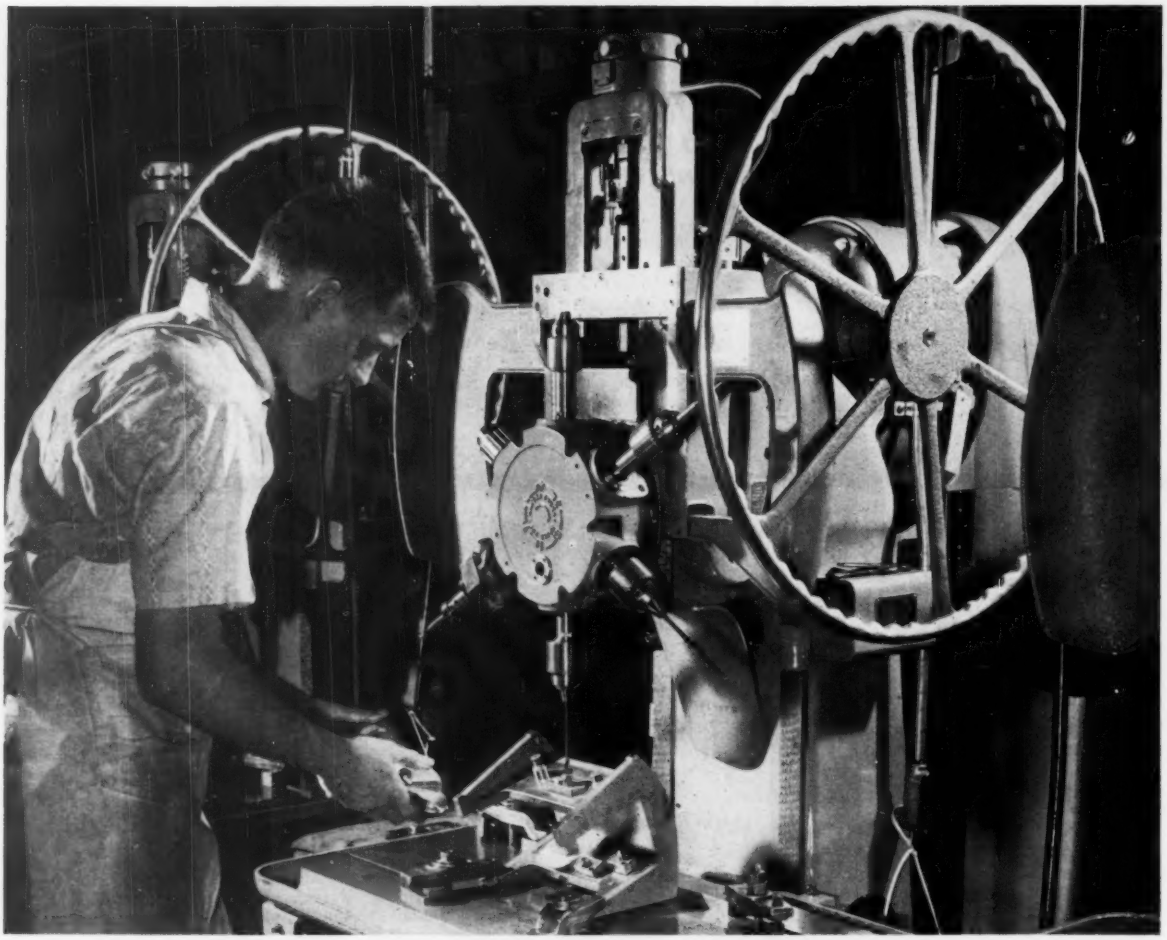
NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

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BURGMASTER® turret drills increase servo actuator production 25%

Here is what they say at Parker Aircraft Company, Los Angeles:

"Our bank of five 6-spindle Burgmaster turret drills have replaced a large number of single spindle machines and on this job performed thirty operations with a production increase of 25%. Drilling, tapping, counterboring and countersinking was accomplished with one set up. Lightweight fixtures could be used and, with fixture clamped in alignment under the spindle, a higher level of quality was maintained with improved finish. Repair work dropped to a minimum."

***Automatic hydraulic Burgmaster** (6- and 8-spindle models) feature skip indexing, automatic cycling and infinitely variable pre-selective feeds. All models (including the 6-spindle manuals and radial) provide power indexing, pre-selective spindle speeds and very close pre-selective depth control.*

For complete information, write Dept. M-2

BURG TOOL
Manufacturing Company, Inc.
15001 S. Figueroa St., Gardena, Calif.

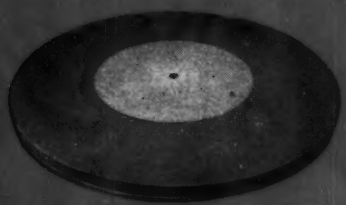
Sales Offices:
RIDGEWOOD, N.J.: Burgmaster Eastern Sales Div.
86 N. Maple Ave., Gilbert 4-3002
CHICAGO: Burgmaster Machinery Co.
5329 Lincoln Ave., UPtown 8-7161
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Gardner Wire-Lokt® Discs



Smooth face for most general purpose grinding jobs



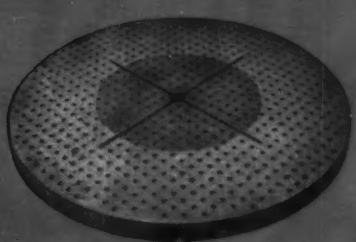
Combination grade maintains a uniform flat surface for the job requirement



Deep corrugated face provides fast, cool cutting



Combined smooth and corrugated face for shear cuts, cool cutting and good chip clearance



Combination grade and face with radial lines for even wear, cool cutting and uniform coolant distribution

How Gardner cuts grinding costs with the right abrasive for the job

—by recommending right type, grade and grain

—by selecting the best cutting surface

and

—by accuracy in filling repeat orders

GARDNER

abrasive discs

BELOIT, WISCONSIN

GIDDINGS & LEWIS MODEL 570-FUAR Floor-Type

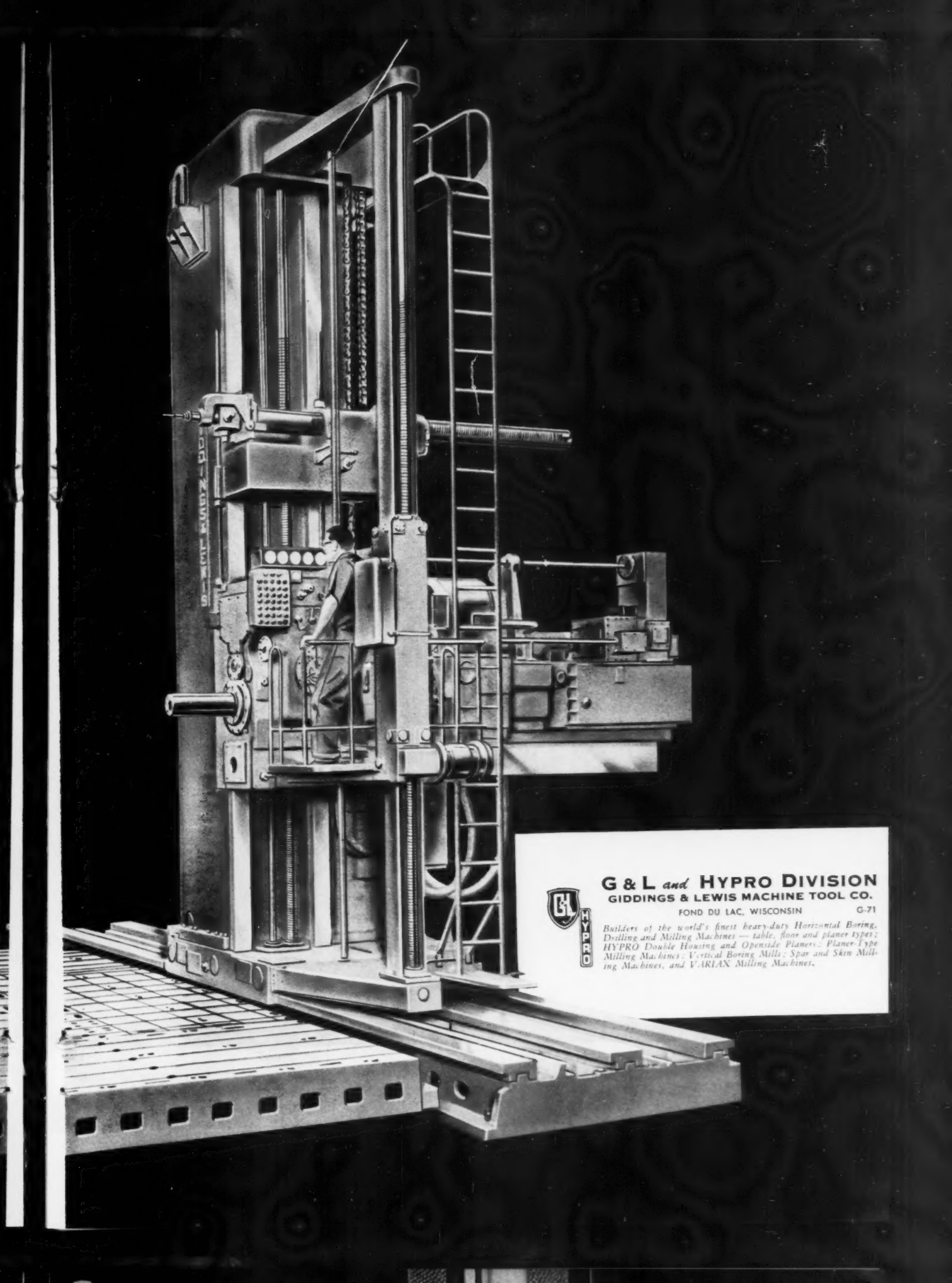
horizontal boring, drilling and milling machine

Power, speed, precision — best describe this modern G&L Model 570-FUAR Floor-Type horizontal with floor plate arrangement, built-in power elevator for operator and end support. Machine also features G&L *Dupli-Tracer* control and heavy-duty underarm for mounting spindle support, angular milling attachment, continuous feed facing and boring head and other time-saving accessories. 50 Series horizontals are offered with 6" and 7" main spindle diameters . . . wide range of speeds and feeds . . . 40-75 hp. For complete information see your nearest G&L representative or write direct.

LITERATURE AVAILABLE

For complete specifications on G&L 50 Series (floor-type) horizontal boring, drilling and milling machines, ask for Catalog No. 50-F.





G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-71

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

cuts going
cuts coming... that's
Double-Cutting

No idle return stroke—cuts both ways. That's why this new GRAY UNIVERSAL PLANER is the most productive planer ever built. Instantaneous change-over from standard to double cut planing. Simple standard carbide tooling.

GRAY is building a large number of these new planers for customers who have recognized that a planer pays when it cuts. This Gray Universal single cuts, double cuts, triple cuts, cross cuts and substantially cuts your set-up and handling time.

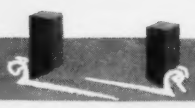
The G. A. GRAY Co., Cincinnati, Ohio





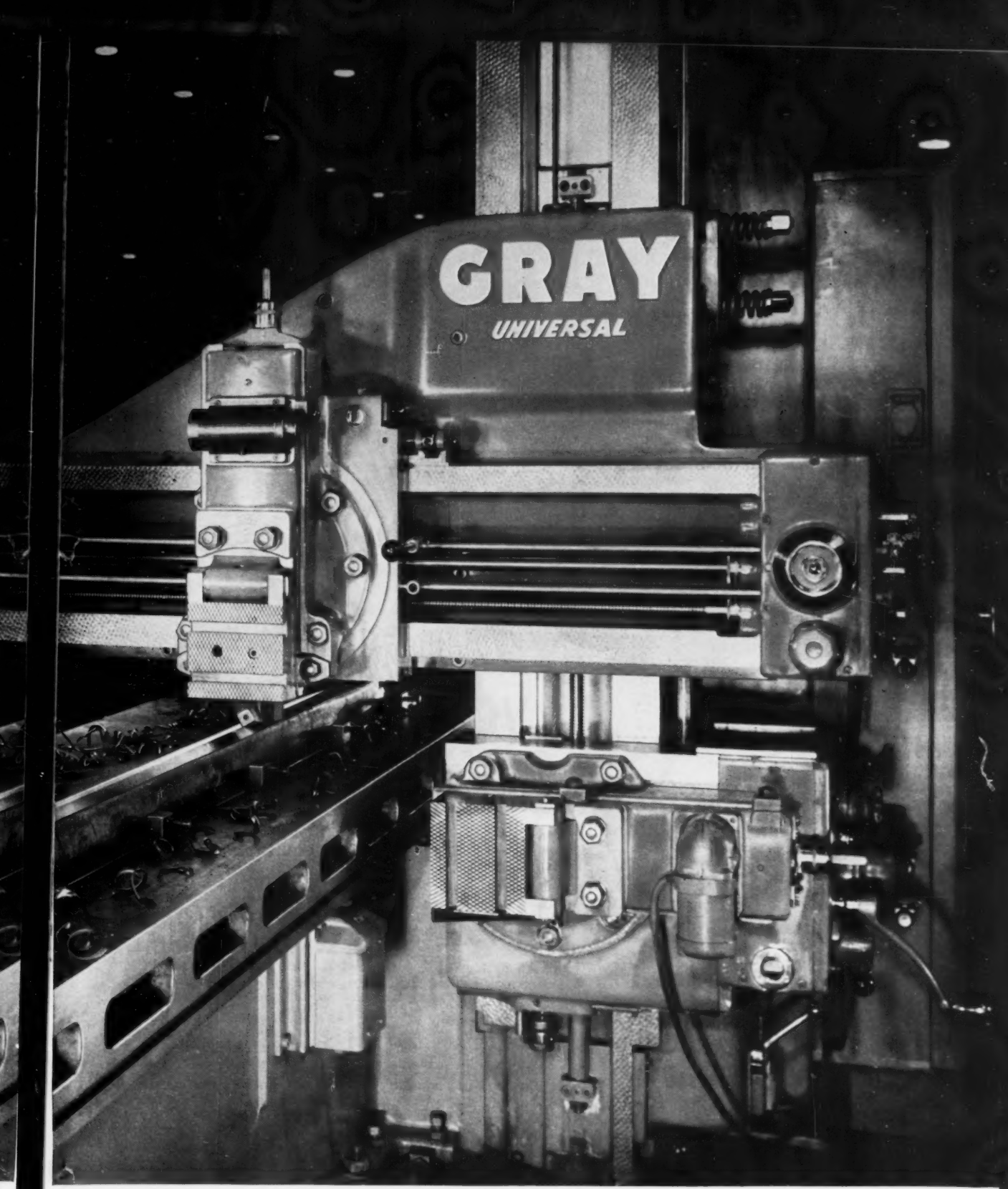
heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.



double cut planing

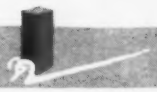
The flick of a lever, the touch of a button permits double cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.





triple cut planing

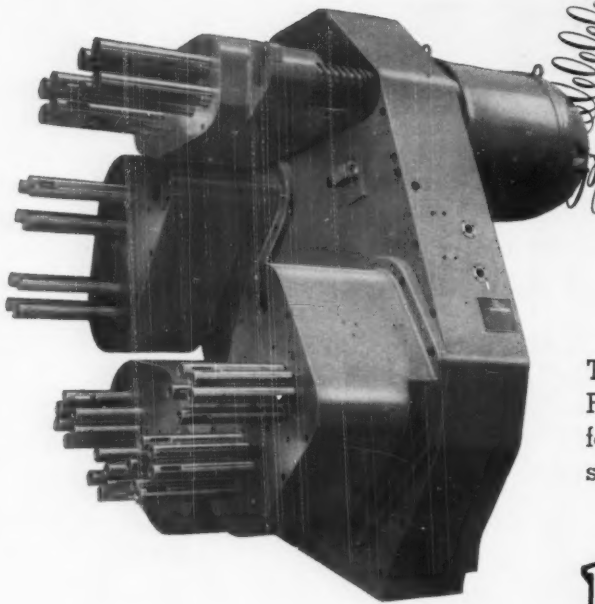
Rough and rough-finish plane at the same time. Rough by double cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

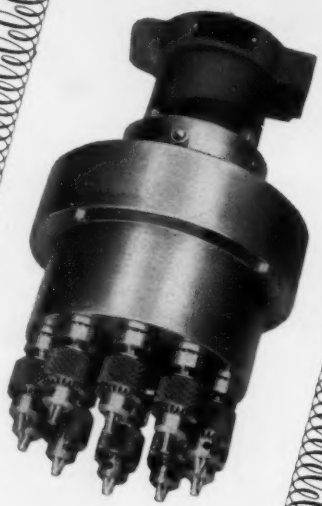


cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

FROM THEN...
...TO ETERNITY





1924

The U. S. Drill Head Company's first Fixed Center Drill Head was produced for Borg and Beck, of Chicago — a subsidiary of Borg-Warner.

1957

The 50,000th Head was shipped.

For men who know drill heads best, it's always U. S. Drill Head ...5 to 1

Since 1915, when the U. S. Drill Head Co. built its first adjustable head, it has far surpassed all other similar manufacturers because of its engineering and production facilities.

Manufacturers of all types of adjustable, fixed center and individual lead screw tapping heads.

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Winner by three points!

The goals are always in *your* favor when you have CIMCOOL® Concentrate on the job in your plant. Here's why CIMCOOL leads the league—actually is the largest selling chemical cutting fluid in the world—winning by three big points:

CIMCOOL LOWERS COSTS because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.

CIMCOOL DOES A BETTER JOB because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.

CIMCOOL IS CLEAN, doesn't soil hands or clothing. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So get in the winning column. See your CIMCOOL distributor. He'll give you full information on *all* the advantages of CIMCOOL Concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids.

Or contact us direct and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive** — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.



time tested designing with MADISON-KIPP zinc and aluminum die castings

The pumping unit is the most vital component in Madison-Kipp high pressure lubricators The one here illustrated is used for pressures up to 2500 lbs.

Free use of iron and steel and brass inserts are features of many lubricator die castings as in the Aluminum Housing shown above.

The exacting service requirements of accurate measuring and forcing devices is something in which we have qualified as experts for nearly sixty years. Perhaps our time tested design formulas may be of help to you.

We will be pleased to review your blue prints.

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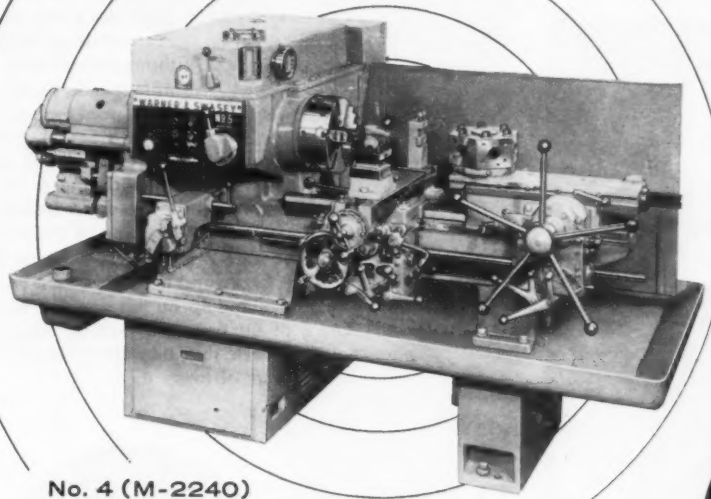
• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

On new Warner & Swasey No. 4 and No. 5 Turret Lathes with new all-hydraulic headstock...

YOU CAN CHANGE SPEEDS

FASTER THAN YOU CAN

TURN THIS PAGE!

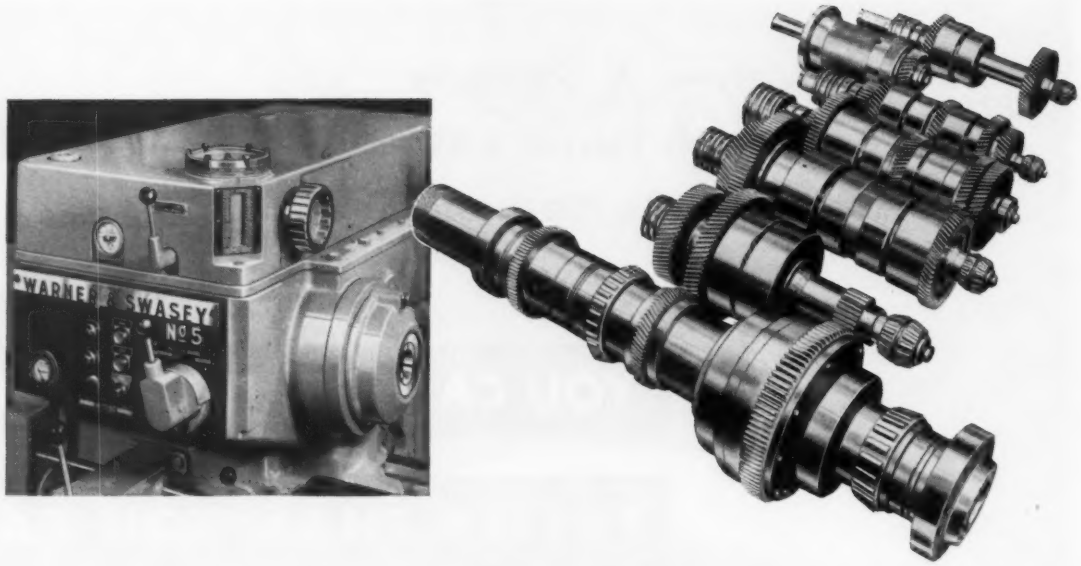


No. 4 (M-2240)
2" Bar Capacity—18½" Swing

No. 5 (M-2250)
2½" Bar Capacity—20" Swing

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

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INSTANTANEOUS SPEED CHANGES

WITH THE FLIP OF A LEVER

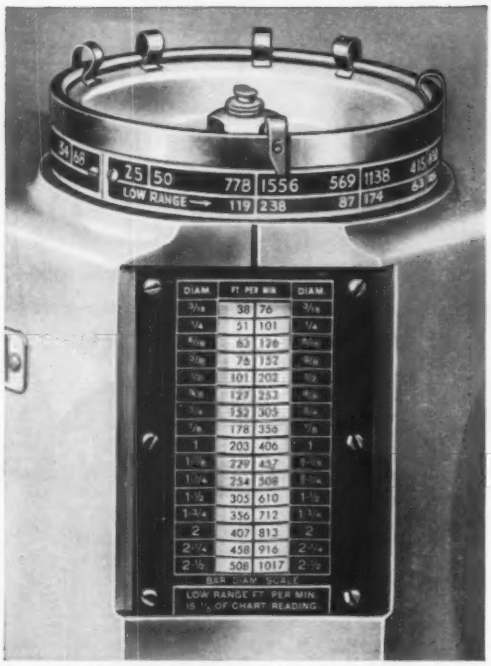
DIRECT-ACTING hydraulic clutches, with a constant-mesh gear train, eliminate all gear shifting on these new Warner & Swasey Ram Type Turret Lathes. Clutches engage smoothly and quickly, providing fast starts, stops, and reverses. Clutches never need adjustment.

With the patented speed preselector the operator can select a new spindle speed while under cut and with a mere flip of a lever, change speeds instantly.

A flip of the speed change lever in the opposite direction provides a valuable 6 to 1 speed reduction for threading or forming cuts —instantly and without preselection.

A total of 12 spindle speeds, or 24 unduplicated speeds with a two-speed motor, are available on these new machines. A touch of a button doubles or halves the speed, and when used in conjunction with the 6 to 1 speed change, four spindle speeds are instantly available with only one setting of the preselector.

A separate master lever controls forward, reverse, brake and neutral. *Zoned controls* on headstock and apron put them all within easy reach of the operator—cutting fatigue, speeding his work, putting more pieces on the floor every hour of every day!



Warner & Swasey's direct-reading, patented speed preselector is calibrated in work diameter, surface feet, and spindle rpm's—which, with the new ease of changing speeds, encourages the operator to use the proper spindle speed.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY



How can you bear being up a tree?

If grinding wheel problems have you in a bearish mood—or even out on a limb—stop growling. Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money* . . . and *increase your production.*

Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So, if you want the bare, down-to-earth facts on how to save money and increase production, contact your CINCINNATI Grinding Wheels distributor. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

(PD) POSITIVE DUPLICATION

CINCINNATI° *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U. S. Pat. Off.

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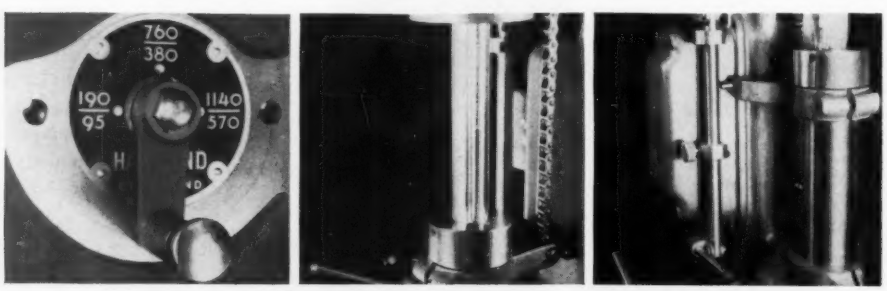
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for *faster* radial drilling and tapping

■ Hammond Radial Drilling and Tapping Machines may be spotted in the production line for drilling, tapping or reaming. With its unique Bracket Type construction the spindle can be swung quickly from hole to hole. Six Quick Speed Changes are instantly available and the Hammond Tapping Reverse is very fast and convenient to operate.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio • Detroit Office: General Motors Building



Engineered for production

FOOTBURT

MACHINE TOOLS

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Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS



Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

HARNISCHFEGER CUTS CHANGE-OVER TIME ON BEVEL GEAR BLANKS

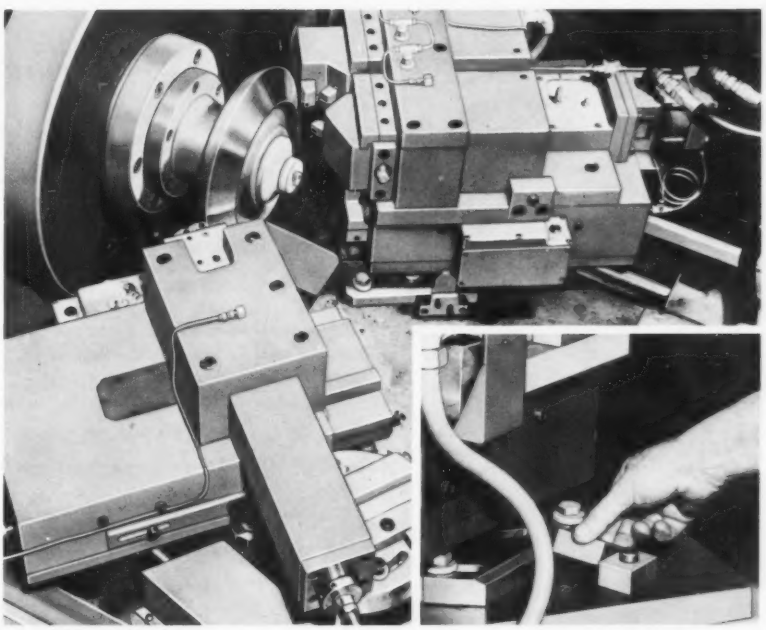
Master gauge blocks speed angular setting of tool slide

You may get ideas from the way Harnischfeger Corp. whipped a problem in bevel gear blank machining at its Escanaba, Mich., plant through installation of a Simplimatic Automatic Lathe.

Only one machine is used to handle three different types of the gear blank workpieces. Two types of workpieces are driven through the bore, from a previously machined spline or keyway. The third type, with a smooth bore, is driven from a lug on the back part of the workpiece. Eleven different workpiece sizes are produced, with yearly production ranging from 60 to 1800 pieces. Individual lots range from 20 to 200 pieces.

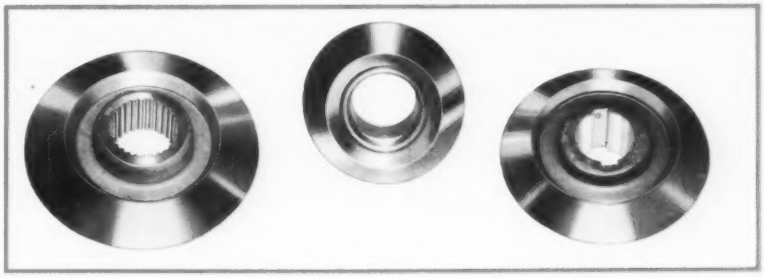
Here's the tooling picture—smartly planned to speed setup and change-over: A swivel-base slide—mounted on the rear of a special wide platen table—is tooled to simultaneously machine the back angle, the front counterbore and face, and break the sharp corners on the workpieces. At the end of the cut, the straddle-type tool blocks swing open for tool relief. Change-over is streamlined by special master gauge blocks with the correct angle machined on one face.

A special tool block with a sliding tool holder is mounted on the front slide. Tool movement is controlled, using a special cam and pedestal arrangement. Front slide movement is translated into correct angular motion by this sliding tool holder, which is controlled by the position the operator sets the cam on the pedestal. An angular dial plate speeds correct setting for the rough and finish front-angle facing operation.



▲ Overhead view of front and rear tool slides. Placing master gauge block between positive locating stop on platen table and swivel base of slide (inset) permits fast, accurate setting of tool slide at precise angle.

The center gear blank (bevel pinion for jackshaft) has smooth bore, is 4⅞" wide with 9⅝" O.D.; lower left (crawler bevel gear) has splined bore; lower right (bevel gear) has keyway in bore. All 3 types handled with this setup. ▼



Simple gauge blocks, swivel-base slide, adjustable slide tops speed change-overs.

F.t.f. time, 2 min. for smallest and 2.30 min. for largest parts handled.

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TIME-SAVING IDEAS

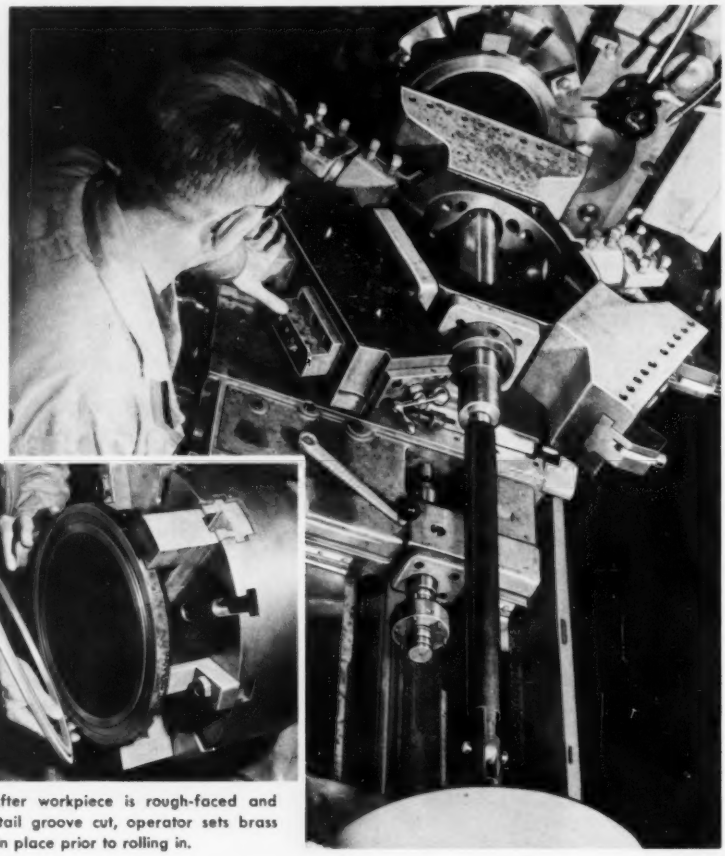
IOWA VALVE CO. STEPS UP OUTPUT WITH SMART TOOLING

Replaces three machines with 2L on variety of valve parts

Perhaps you, too, can take advantage of this setup used by Iowa Valve Co., Oskaloosa, Iowa—demonstrating how a standard saddle type turret lathe can be specially tooled to handle a variety of part sizes, combining standard and special machining operations.

Here's how the workpieces—4", 6", 8", 10" and 12" diameter low-pressure valve gate seats—are machined with minimum change-over time between sizes: All work is from a cross-feeding hexagon turret. Special tool blocks are used, with extra tool slots or easily adjusted tool holders to handle the complete range of parts. Work sequence includes rough-facing the gate, machining dovetail groove to accept brass seat ring, rolling in the ring, facing it off and chamfering it on the O.D. and I.D.

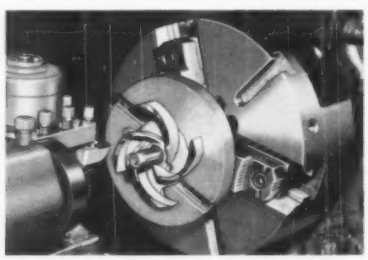
The rolling-in of the brass ring is particularly interesting. A special air-operated thrust bar, mounted on the end of the bedways, forces the ring into its machined seat. This setup eliminates additional equipment and operations, formerly required to bore the dovetails for mounting the seat rings and shrinking them into place.



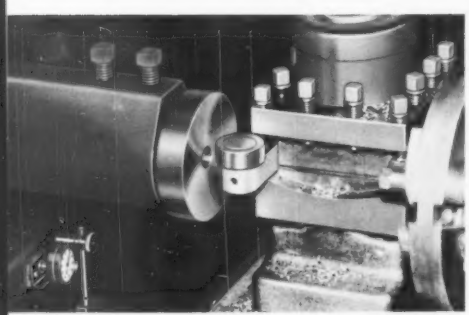
▲After workpiece is rough-faced and dovetail groove cut, operator sets brass ring in place prior to rolling in.

▲Rolling-in operation, showing thrust bar rotated 90° to align with rolling-in tool block, and special short stop roll which permits mounting thrust unit at end of bedways.

Floor-to-floor time is 8 min. for largest part, 3.7 min. for smallest. Special tool blocks minimize change-over.



▲Six-degree angle generated on vane faces of pump impeller used in water-going M-59 Armored Personnel Carrier.



◀Cross slide carriage is guided by contact of roller-follower on cam disc. Note dial indicator for accurate length setting.

50% INCREASE WITH THIS SETUP

Arrangement permits angular facing cut to close tolerance

There may be a tip for you in the way Food Machinery & Chemical Corporation's Ordnance Division, San Jose, California, solved this problem: how to increase production of a phosphor-bronze pump impeller—requiring a difficult interrupted-cut facing operation—and eliminate breakage of form tools.

The solution was this unusual device—a tapered cam disc, mounted on one hexagon turret face of a No. 4 Ram Type Turret Lathe. Here's how it works: The hex turret ram is brought forward against a dial indicator for accurate end location and locked in place. A roller-follower, mounted parallel to the cutting tool on the square turret, is moved in to engage the cam disc. Then, using the cross slide carriage to hold the roller-follower against the face of the cam, the required angle is generated on the vane faces.

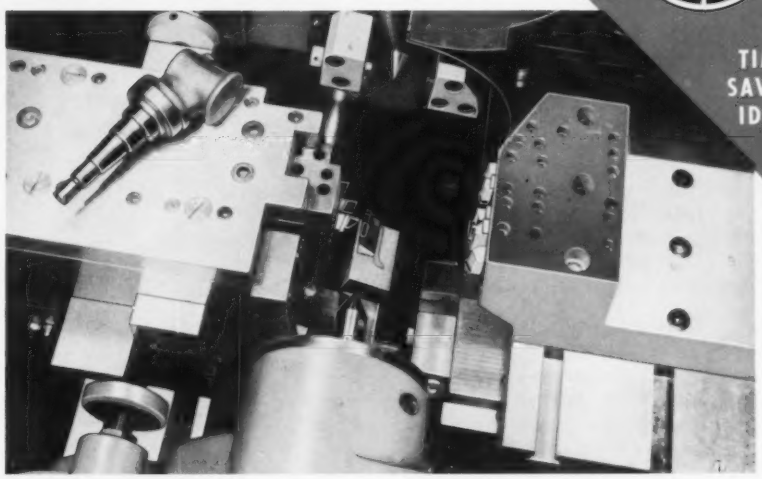
With this setup, the finished part is machined to a tolerance of .0015". Production was increased 50% on this job, and tool breakage was eliminated.

GISHOLT

TIME-SAVING IDEAS

TWO TURNING OPERATIONS WITH 1 BASIC SETUP

Cam-operated auxiliary slide on No. 12 Automatic Lathe turns 6 diameters



Multiple tooling setup removes maximum stock in minimum time—over entire length of piece.

Perhaps you'll spot a production pointer in the way this customer is rough- and finish-machining steel steering knuckles with one machine—holding setup, tool adjustment and down time to the minimum.

The part is held between centers and driven by a face-plate driver. All six diameters are turned from three tools on an auxiliary slide mounted within the front carriage, which also mounts a flat cam to govern movement of the auxiliary slide.

The two lead tools turn the two largest diameters. The third tool, governed by the cam, turns the other four, including the taper. A separate tool-carrying holder—attached to the front carriage base and extending under the workpiece toward the headstock—carries three chamfering tools. Tools on the rear independent slide finish all of the fillets, shoulders and reliefs.

For the first operation, chamfer tools are removed from the front tool holder and one radius tool is removed from the rear slide. When the entire lot is machined, these tools are replaced; the front carriage is reset and rear slide feed stops are adjusted to finish dimensions, and the workpiece is finish-turned for grind. Floor-to-floor time for each operation is 0.9 min.

With this setup, customer has advantages of multiple tooling, with flat-cam operated auxiliary slide simplifying tool setting.

HOW CARTER MOTOR CO. SAVES TIME, CUTS BALANCING COSTS

Measures, corrects and inspects for balance in single handling

Your production costs can be materially reduced when measurement, correction and inspection for balance are performed in a single handling. Here's how it's being done at Carter Motor Co., Chicago, using a Gisholt 1S DYNETRIC Balancer.

The workpieces are Dynamotor armatures, produced in large quantities and used as a power source for many different types of two-way military radio equipment.

The parts are placed on the standard balancer work supports and rotated. The Direct Reading Amount Meter is calibrated so that one unit equals 1/16" length of 1/16" diameter solder. The stroboscopic light indicates the angle where the unbalance lies at each end of the part, and the meter tells exactly how much solder the operator should add in each correction plane.

The operator stops the machine and places the required amounts of solder at the indicated angles on the wire bands at the ends of the armature segments. Then the machine is started again and the operator flips two switches, one for each correction plane, to inspect for balance.

The Gisholt Balancer easily keeps pace with the rest of the production line, balancing all parts to low tolerances with ease and efficiency.

Any standard Gisholt Type S Balancer can be arranged to measure, correct and inspect for balance without removing the part from the machine.



◀ Operator ready to inspect part for balance. Tolerance is .001 ounce-inch in each correction plane. This is represented by one unit on the Direct Reading Amount Meter, and equals 1/16" length of 1/16" diameter solder.

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MASTERLINE
GISHOLT SINCE 1887

TIME-SAVING IDEAS

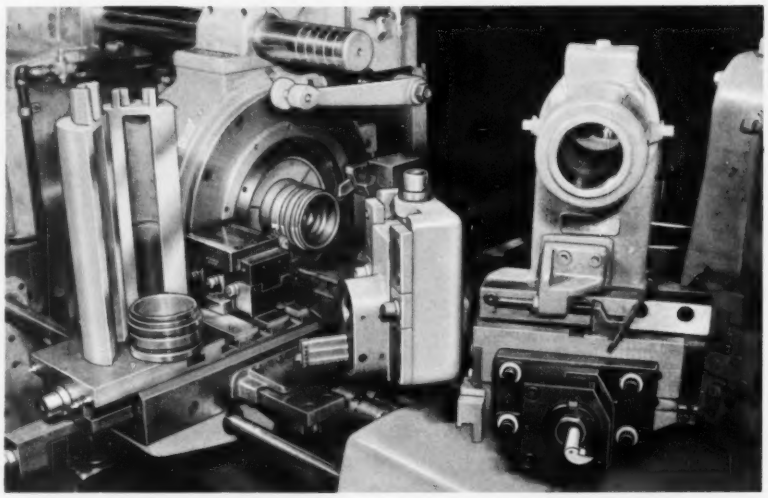
OVERMYER BOOSTS NECK RING PRODUCTION WITH FASTERMATIC

Automatic turret lathe cycle includes collet chuck and stock pusher operation

If you have exacting jobs like this—combining multiple-diameter machining with close-tolerance grooving and forming operations—you'll see why Overmyer Mould Co., of Greensburg, Pa., finds MASTERLINE 2F Fastermatics ideal.

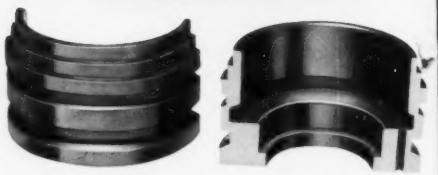
Here's Overmyer's setup with the automatic turret lathe tooled to handle a variety of cast iron neck ring moulds. Special equipment includes a 6¼" capacity, hydraulically operated, parallel-closing type collet chuck, mounted on a special steady rest. Ring stick castings in two sections are inserted in the collet and chucked on the O.D., which has been previously machined.

A push button actuates an overhead-mounted, swinging locating-stop, feeds the stock out to length and closes the collet. Another push button retracts the stop. With the overhead stock stop, all six turret stations can be used—to bore, form, groove, chamfer and face in the I.D. Tools in the magazine-type holder, mounted on the front cross slide, machine the entire O.D....the finished part is cut off from the rear cross slide...and the cycle repeats.

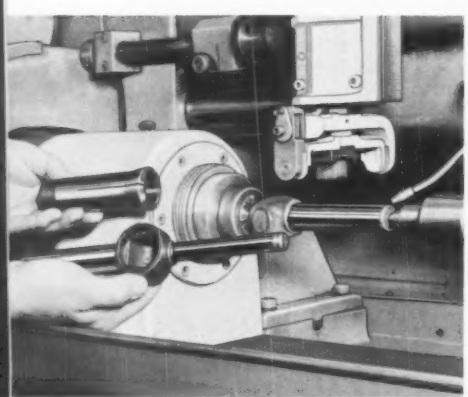


▲ Fastermatic — equipped with automatic swinging-locator, stock feeder and collet chuck—speeds work handling, assures consistent accuracy on close-tolerance neck ring moulds.

Two-segment workpiece, showing surfaces machined in this job. ▶



The neck ring mould shown here is completely machined in 4.9 min. f.t.f. Five parts are machined from each stick casting. Loading and unloading time for ring stick castings is only 0.4 minutes.



Collet holds on small, Superfinished diameter while large diameter is completed. Change-over requires only two sizes of collet and two Superfinishing stones.

LOW-COST SUPERFINISH ON SHORT RUNS

Simple setup handles 2 diameters on piston rods

You'll see ways to save from this typical setup—it reveals how modern tool rooms and job shops utilize Gisholt general-purpose Superfinishing machines to handle a wide variety of work.

The workpiece—a piston rod for a reciprocating pump—requires a low micro-inch finish to reduce leakage and extend packing life. It is 11" long, with two different diameters extending 4" each side of center to be Superfinished.

Tooling costs are held to a minimum. A standard collet holds the work on the large diameter. The smallest diameter is Superfinished first, using a tailstock support and formed stone. When the lot is completed, the collet is changed for the small diameter...the stone also is changed...and the large diameter is then Superfinished.

Both diameters are Superfinished from 80-100 down to 5-7 micro-inches R.M.S. Floor-to-floor time for each operation averages just 1 min.

Ample capacity, easy setup make 51A and 52A Superfinishers ideal for general-purpose work—on long or short runs. Automatic rough and finish cycle provides finer finish in less time, with minimum attention from the operator.

No. 1-257
671

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

PRINTED IN U.S.A. 12-56

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

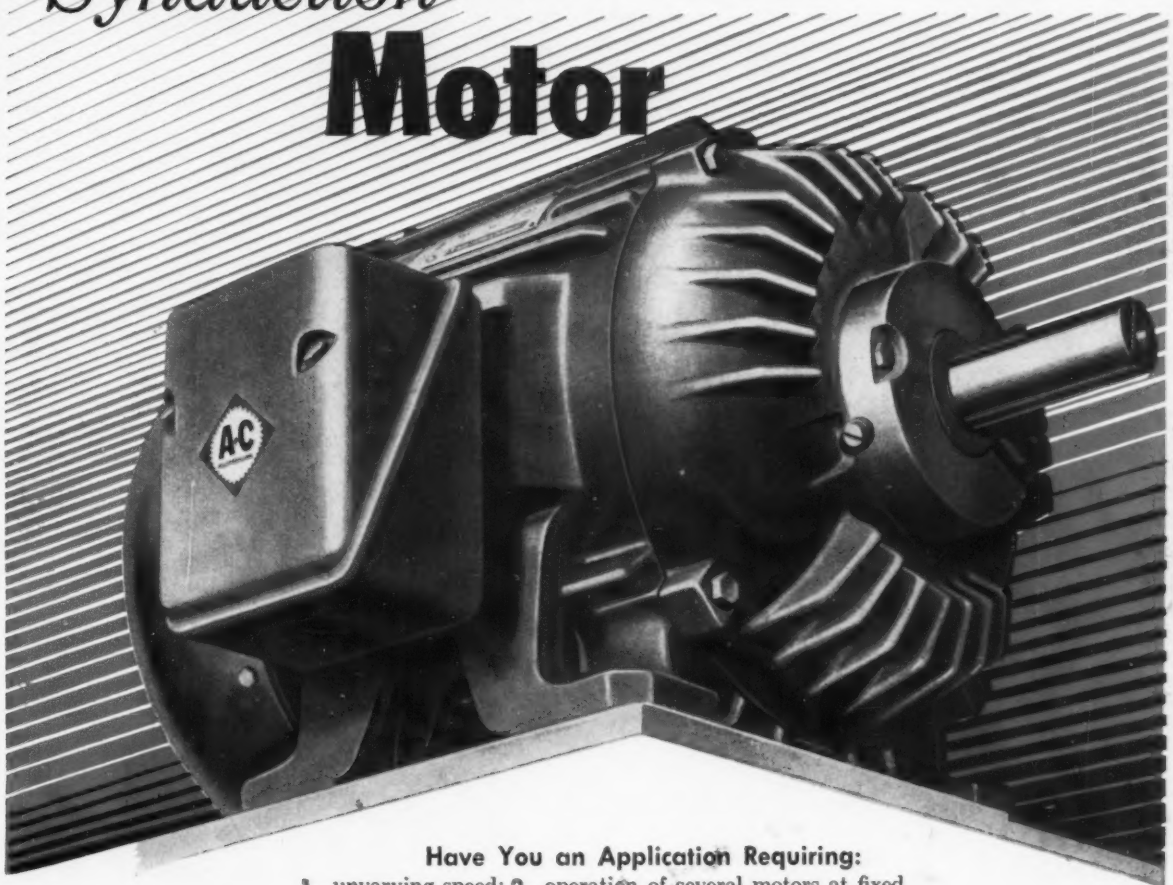
NOW dependable constant speed at less cost

Here's a motor with all the constant speed benefits of synchronous design at initial low cost — with the dependability of an induction motor. It's the NEW *SYNDUCTION* motor, built specially for applications from ¼ to 40 hp.

DEPENDABLE — Now constant speed, regardless of load or voltage changes, is sure . . . depends only on frequency. *Synduction* motor's simple die-cast rotor has no brushes, collector rings, nor insulated rotor windings.

LOW COST—Simple across-the-line control is all that's needed. Further, design permits use of frames smaller than usual reluctance-type motors. Purchase price is well below that of ordinary reluctance-type motors.

New *Synduction* Motor



Have You an Application Requiring:

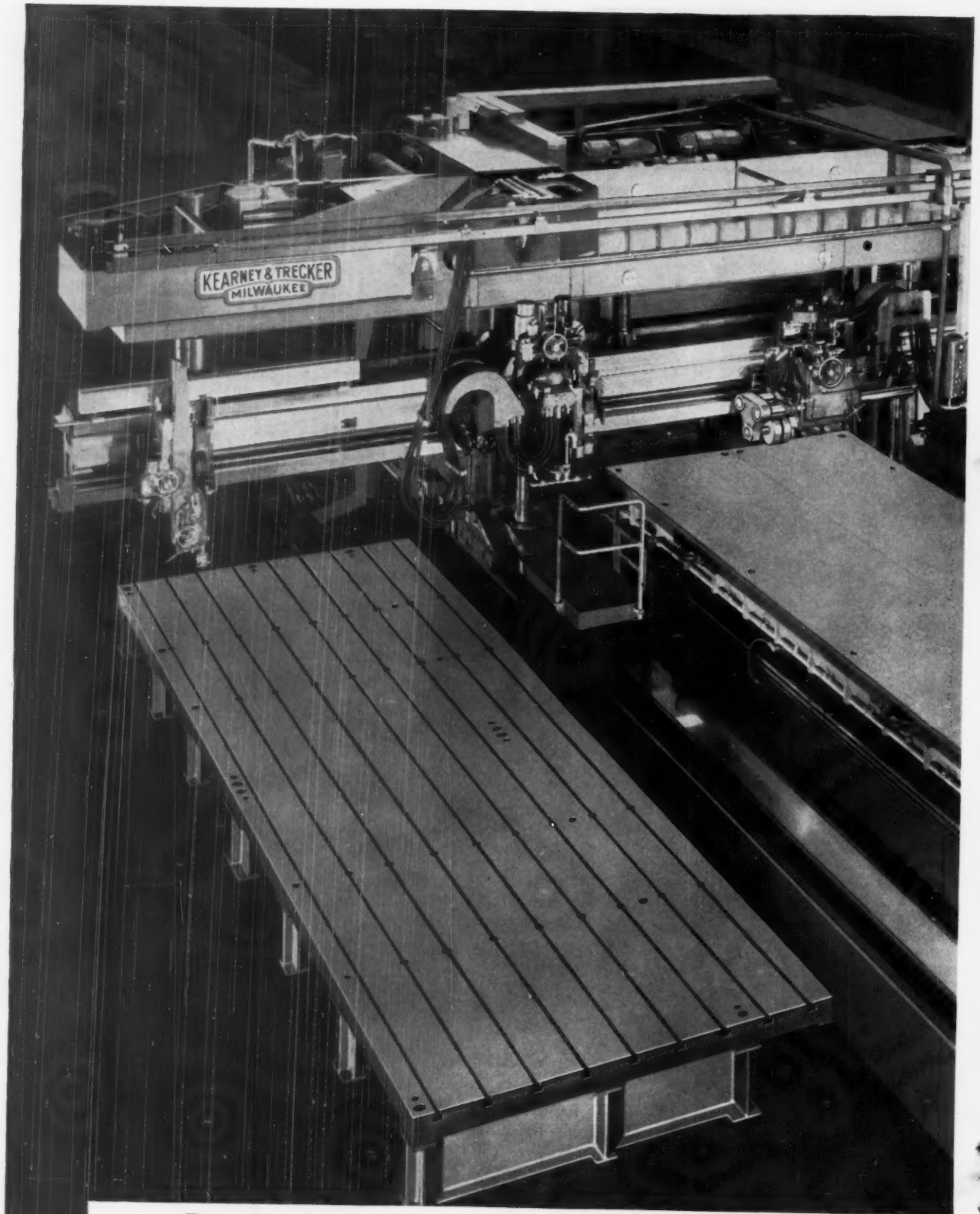
1. unvarying speed; 2. operation of several motors at fixed speed ratios; 3. adjustable speed with minimum variation at any speed setting? If so, Allis-Chalmers invites your inquiry. Contact your nearby A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin, for Bulletin 51B8440.

Synduction is an Allis-Chalmers trademark.

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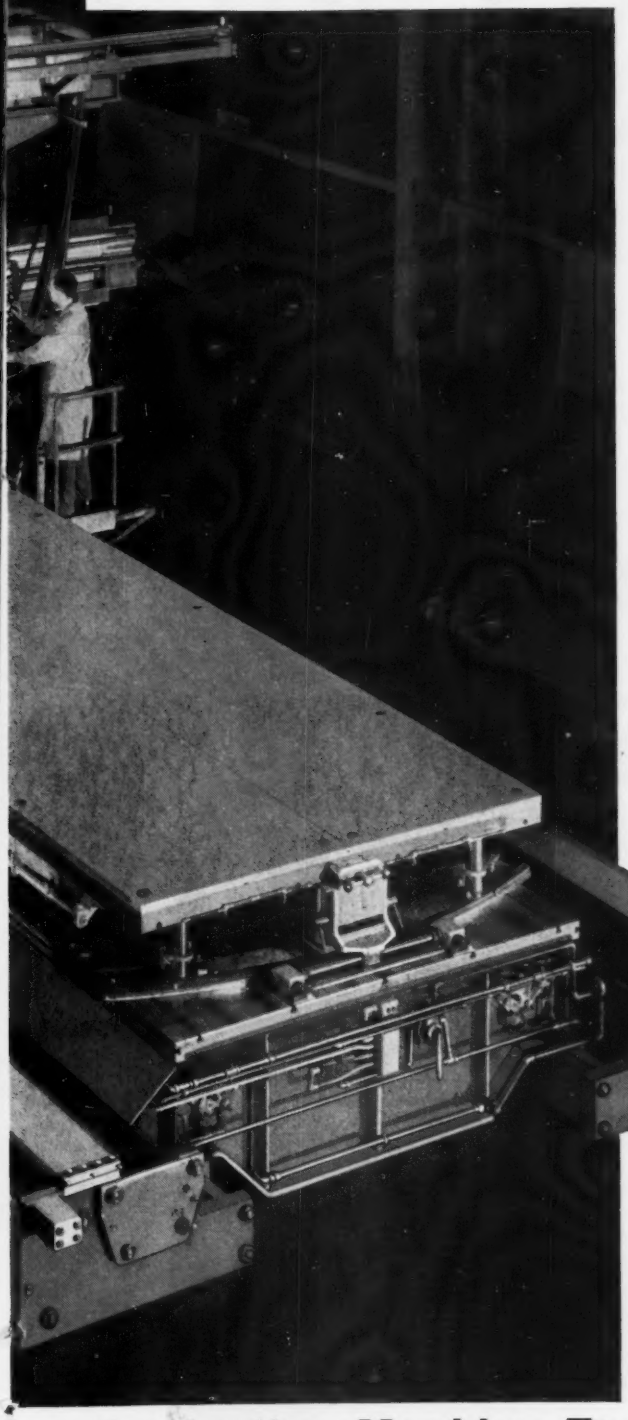


Designers and Builders of Precision and

Picture your workpiece on this 175-ton

KEARNEY & TRECKER MILWAUKEE

gantry type milling machine



THIS massive giant, 42 ft. long, 35 ft. wide, is equipped with electronic tracer control system designed for production milling of intricately contoured workpieces. Rugged enough to mill all metals . . . sensitive enough to hold close tolerances . . . it meets all A. I. A. specifications and has extendable bed design. Gantry type machine takes much less floor space and permits handling larger workpieces or multiple workpiece setups. Machine incorporates standard design components with automatic programming control systems available.

For more specific information on this gantry type milling machine, have our representative call at your convenience . . . or write to Kearney & Trecker, Special Machinery Division, 6788 West National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

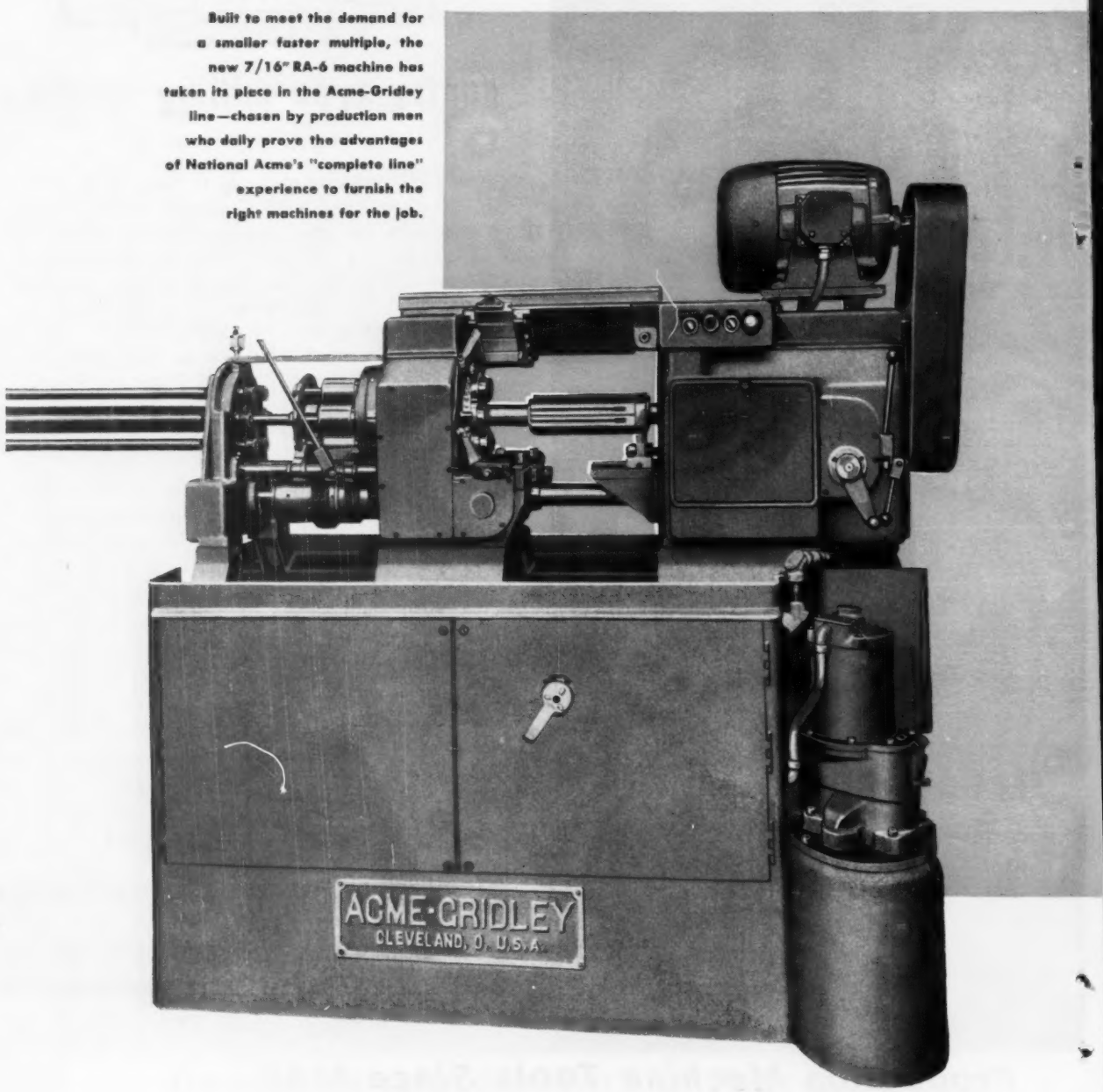
Production Machine Tools Since 1898

LIKE ALL

Acme-Gridley

BAR AUTOMATICS . . . . . .

Built to meet the demand for a smaller faster multiple, the new 7/16" RA-6 machine has taken its place in the Acme-Gridley line—chosen by production men who daily prove the advantages of National Acme's "complete line" experience to furnish the right machines for the job.



. . . THE NEW 7/16" SIX

gives you lowest cost per piece

HIGH PRODUCTION ACCURACY—sustained at highest speeds and feeds through proper weight distribution and support of toolholders without overhang.

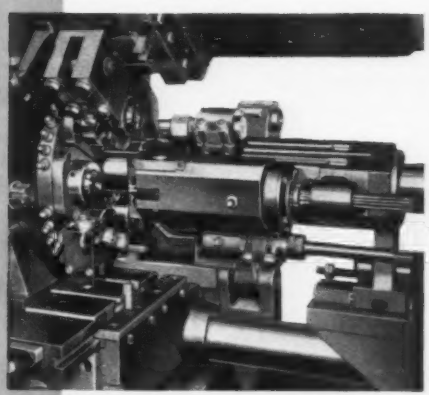
WIDE TOOLING VERSATILITY—through independently operated cross slides, spindle stopping (optional) and a variety of standard and special attachments.

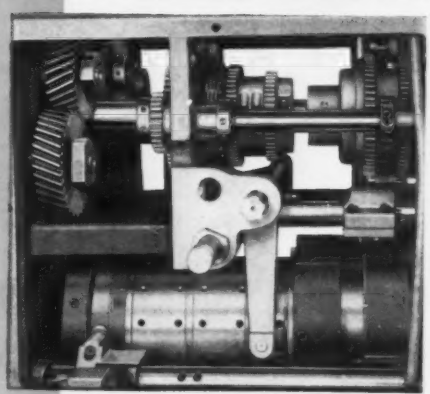
LONG OPERATING DEPENDABILITY—with extra reserve power and strength for top performance with *all* tools.

★ ★ ★

Let our representative show you how Acme-Gridleys can work for you; meanwhile, *write for your copy of* MRA-56 *for specifications of the new 7/16" Six.*

Unusually large tooling zone permits ready access for installation and adjustment of tools and attachments. All slides are wide and heavy, providing maximum support without overhang.





Gear box section accommodates drive control for all accelerated end-working attachments, spindle speeds and feeds . . . easily accessible through large openings on either side.

INDEX . . . to lower machining costs . . . with *Acme-Gridley* **CONTROLLED CYCLE**

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MACHINE OF

SENECA FALLS AUTOMATIC LATHES CUT MACHINING COSTS FOR ROAD BUILDING EQUIPMENT MANUFACTURERS

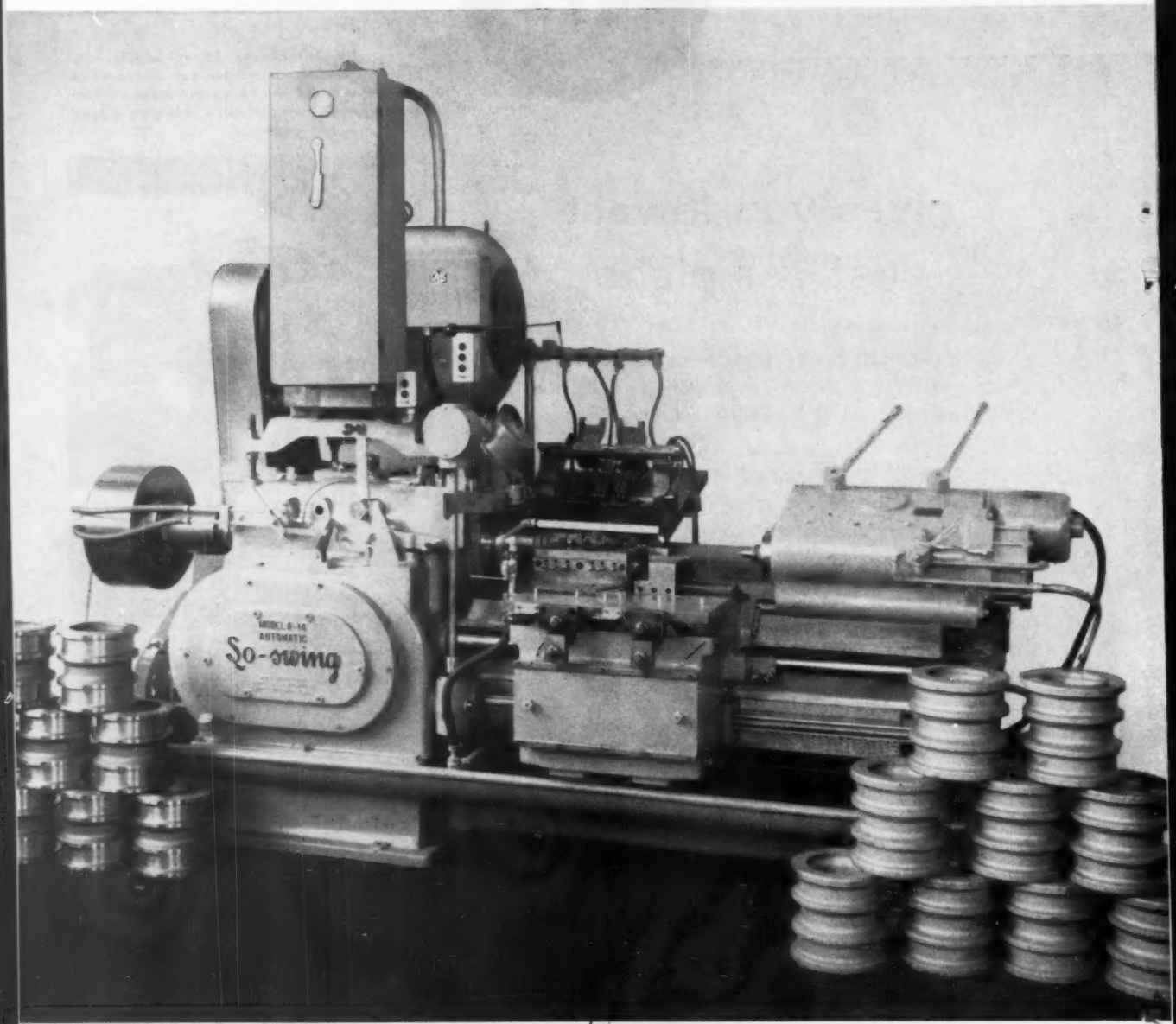


Fig. 1. *A Model "R-14" Automatic Lo-swing Lathe equipped for automatically turning, facing and chamfering Track Rollers in a single operation. The Track Rollers, 9¾" in diameter and 9⅜" long, are held and driven from the rough forged bore with a compensating type, six-jaw, air-operated driver. The tailstock, shown in the withdrawn position, is electrically operated and has a travel of 16" to facilitate loading and unloading of the rollers on the driver. All tools are carbide, operating at 350 ft. per minute. Total floor to floor time is 3.5 minutes each.*

PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Today's mammoth Road Building Tractors and Machinery require the most modern and heaviest machine tools to complement the fine engineering and manufacturing skills of Construction Equipment Manufacturers.

The Model "R-14" and "R-18" Automatic Lo-swing Lathes have already demonstrated their fine performance with carbide tools in Construction Equipment Plants. Their rigid construction and ability to stand up under the heaviest cuts, coupled with positive mechanical feeds, wide flexibility and servicing simplicity, are all important advantages of the Model "R" type of Lo-swing Lathes.

Figure 1 is an overall view of a Model "R-14" Lathe equipped for machining track rollers. Figure 3 is a close-up view of the tooling, consisting of six front turning tools, eight heavy rear facing tools, eight small chamfering tools and two chamfering tools for the inside diameter. Note the special cam-operated, 45° inside bore chamfering attachment on the headstock of the lathe. Swivel type tool setting gauges, mounted directly on the tool blocks, reduce tool setting time.

Figures 2 and 4 illustrate turning, facing and chamfering operations on large Cylinder Liners 11½" diameter by 22" long. The liner is held and driven by a special driver, mounted on the headstock spindle, which has two rows of six air-operated driving jaws. Each row is operated by its individual pull bar (Fig. 2) thus equalizing the air pressure on both sets of jaws, which are positioned at the point where the liner wall is the thickest.

The liner is positioned on the driver in relation to the ports, previously cut around the circumference,

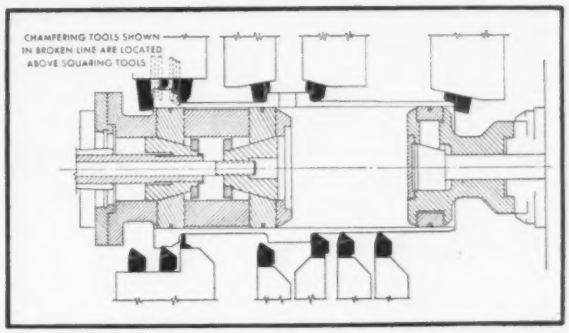


Fig. 2. *Details of arbor construction and location of 22 cutting tools.*

by a locator arm (Fig. 4) which enters one of the ports. An air-operated assist lever then holds the liner tight against the locator until the driving jaws grasp it. A safety switch above the locator arm prevents the machine from being started with the locator in the engaged position.

The relieving type tailstock has a 20" stroke, operated by a motorized lead screw, permitting easy removal of the liners from the long driver. Its large revolving spindle is fitted with an air-operated, ring type, expanding arbor which supports the liner at the tailstock end. A 60 H. P. motor drives the machine and the floor to floor time is 5.2 minutes.

The above are only two of the many parts used by Construction Equipment Manufacturers which may be machined on Lo-swing Lathes with substantial economies. Engineered jobs are our specialty. Our engineering staff is at your disposal to assist in solving your turning problems.

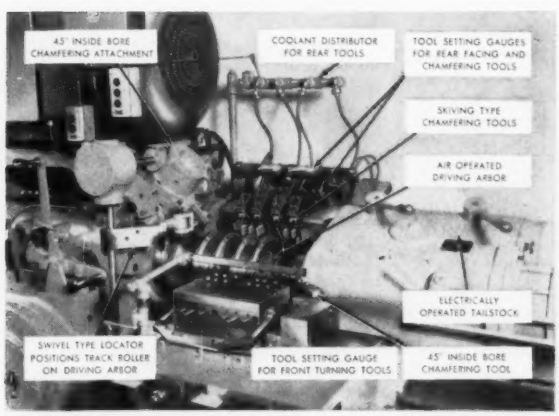


Fig. 3. *Close-up view of tooling for track roller job.*

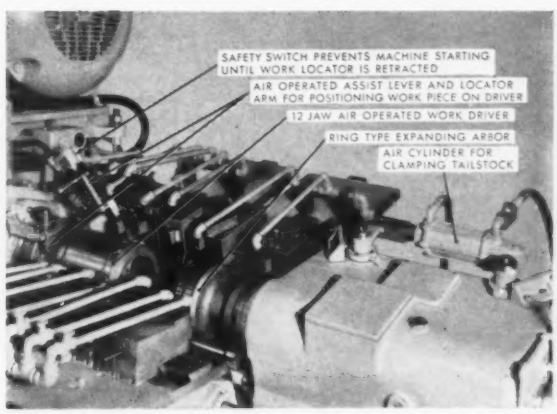
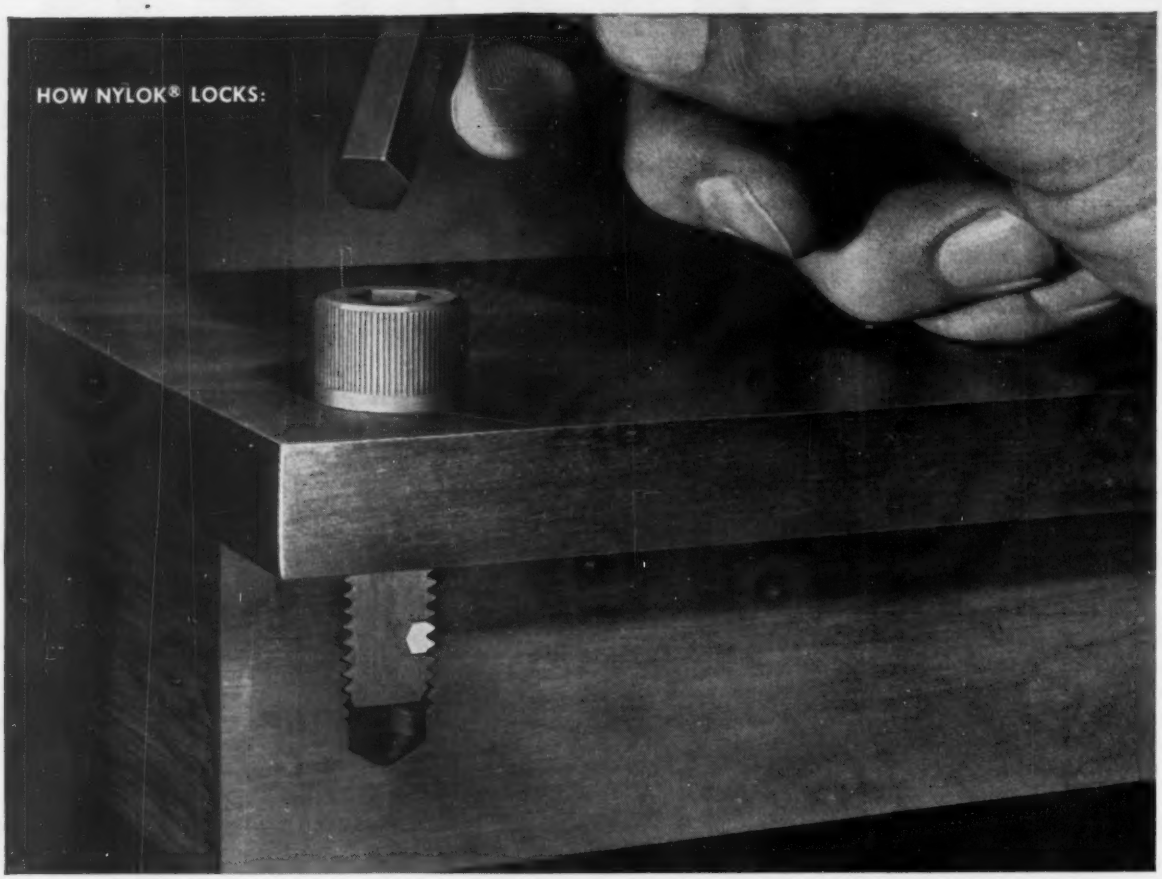


Fig. 4. *Close-up view of tooling and tailstock for liner job.*

ARE LOWER WITH Lo-swing



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

NEW—self-locking UNBRAKO socket head cap screws



Self-locking UNBRAKO socket head cap screw.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

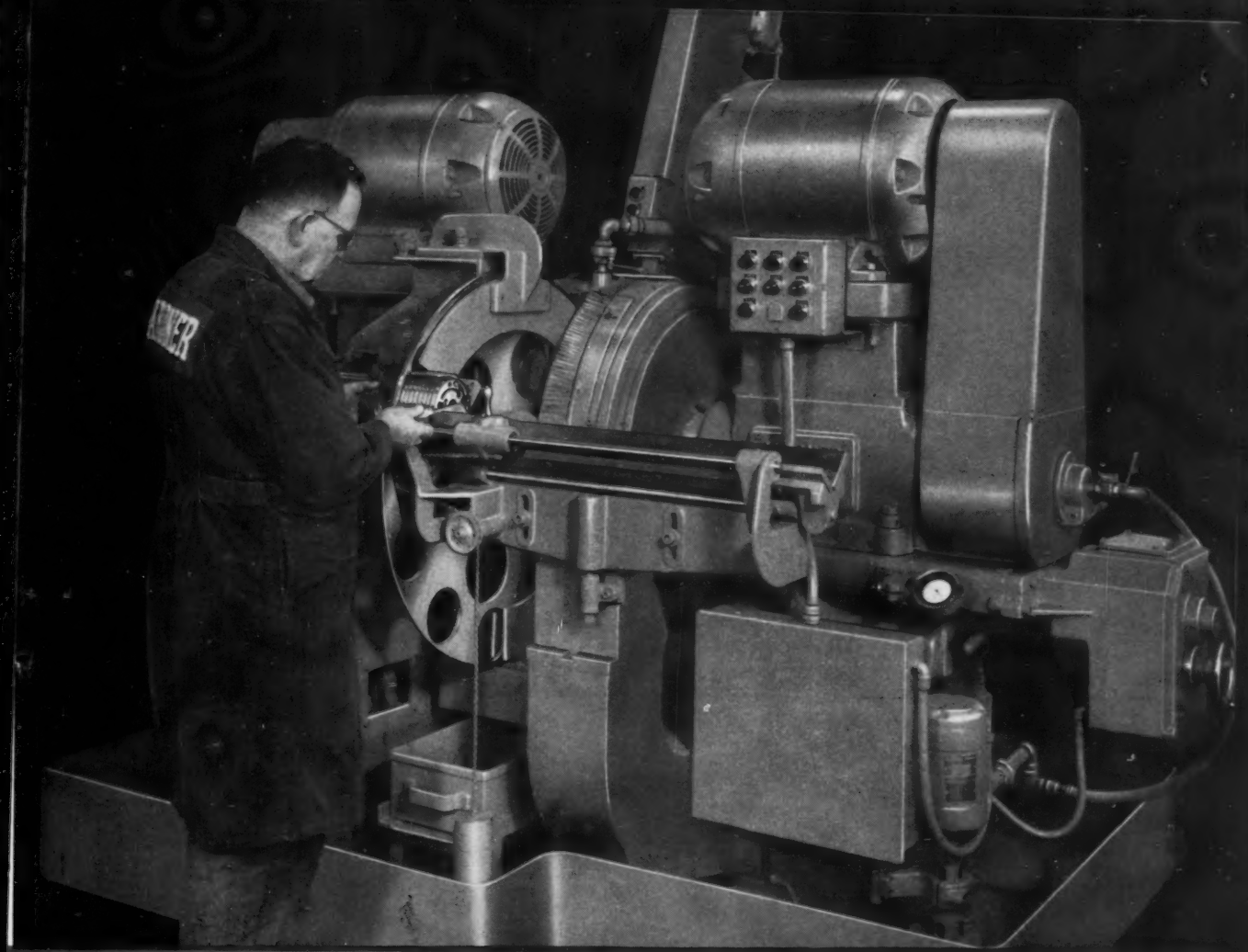
STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION

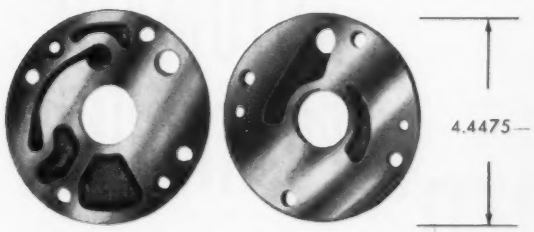
SPS

JENKINTOWN PENNSYLVANIA

For more information fill in page number on Inquiry Card, on page 239



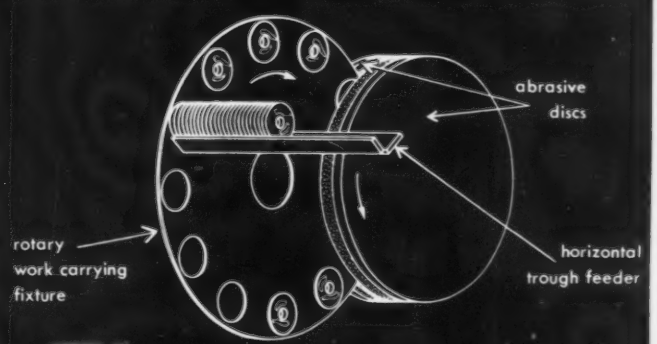
Grinds 1200 flat surfaces of unequal area per hour



Cast iron oil pump cover

Grinds **TWO** parallel surfaces

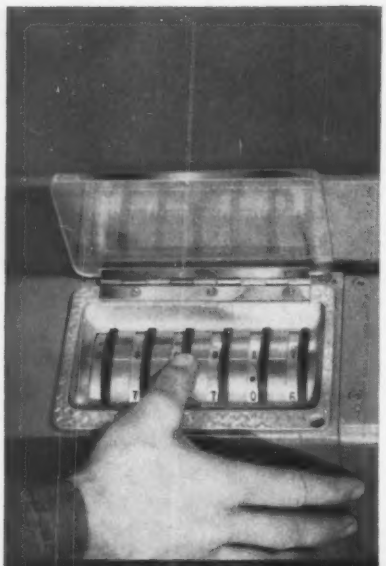
in **ONE** operation



GARDNER

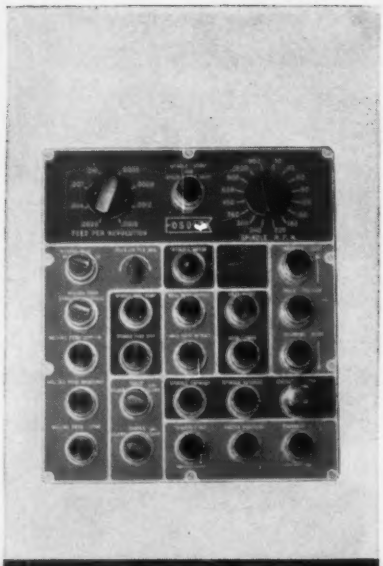
precision disc grinders

BELOIT, WISCONSIN



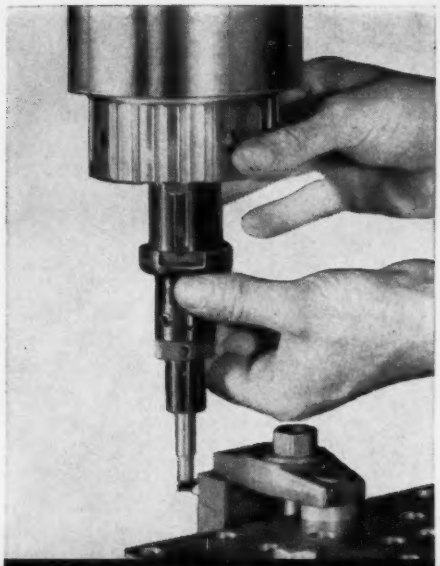
MEASURE

Dial dimension direct from print. There are two sets of direct-reading drum dials, one for longitudinal, the other for transverse position. Operator simply sets dials so that numbers on dials correspond with numbers on blueprint. Simple. Direct. Precise.



POSITION

Press two buttons, one for longitudinal, one for transverse positioning. Table, and work, are automatically positioned, and clamped under the tool, accurate to ± .0001"! Accuracy is dependent upon highest-quality gages, not upon screw threads. Sensitive .0001 Dial Indicators maintain a positive check at all times.



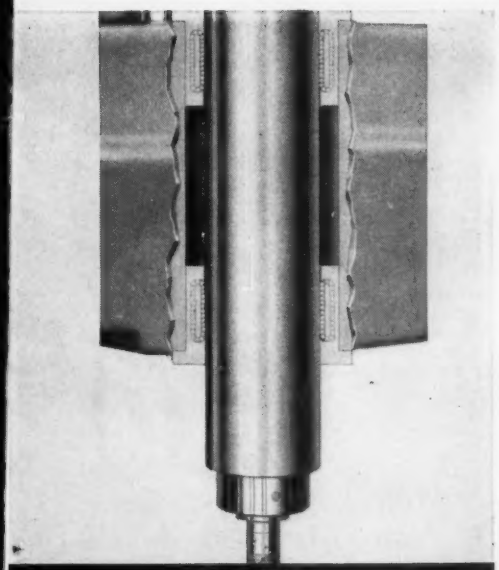
CHANGE TOOLS

Tool changing takes less than 10 seconds, with BF spindle. Can be accomplished while table is positioning. Hole sizes are repeated within ± .0001", without resetting tools! High-precision tool holder is built right into the spindle of the Jig Borer. Adapters accommodate both standard and special-sized tools.

FOSMATIC JIG BORER

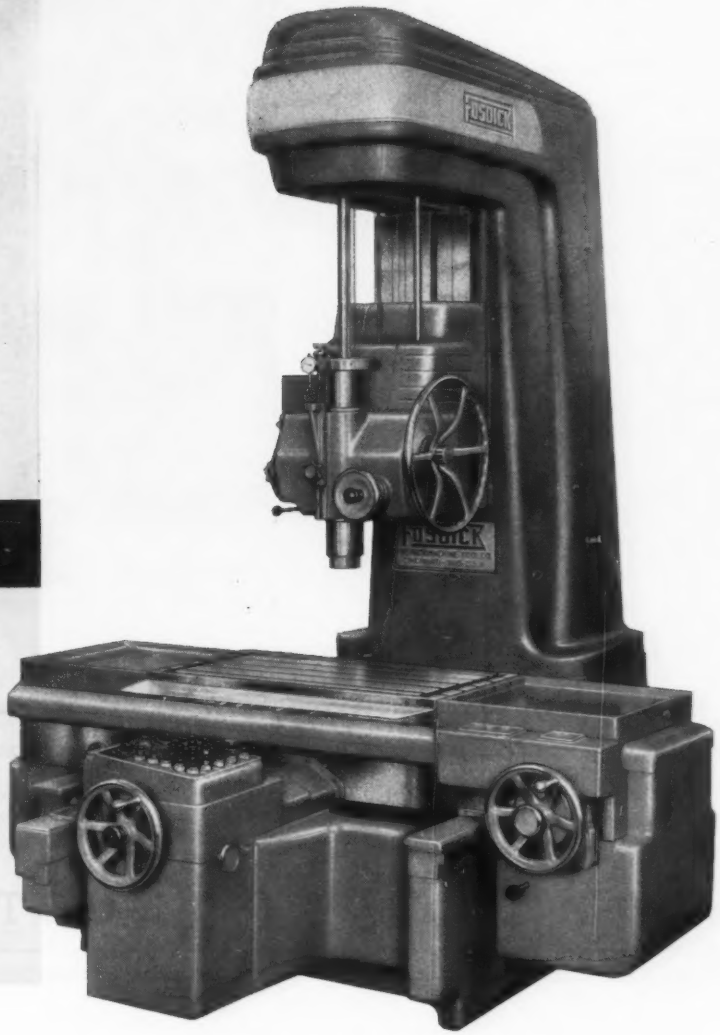
AUTOMATIC POSITIONING

DIRECT DIMENSION MEASURING



BORE

Push-button precision boring. **For finish boring, change tools quickly, then bore at touch of button. The hardened alloy steel quill rides on 800 preloaded balls mounted in precision bushings located permanently at top and bottom of head—as close as possible to spindle nose for maximum rigidity. Spindle is guaranteed not to exceed .0002″ runout at the end of 12″ proving bar!**



MEASURE - POSITION - CHANGE TOOLS START BORING . . . ALL IN SECONDS!

hole size and position accurate to ± .0001.

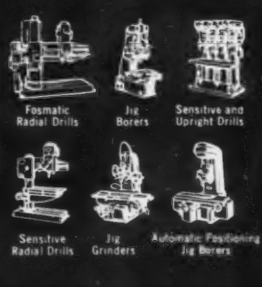
The new Fosdick Jig Borer can be used for the finest toolroom boring or for production of precision holes. Like the scores of Fosdick Jig Borers in plants throughout the United States, this machine will perform consistently to ± .0001″ . . . in measured table and saddle position as well as hole size.

The Fosmatic Jig Borer is extremely simple to operate. Changing of feeds and speeds, all movements of the table, saddle, and head can be accomplished by push button. Spindle is started and stopped by lever on head. Machine may be equipped with or without automatic positioning. Can be equipped for numerical control with either tape or card systems.

Other features available as extra equipment include Milling Feed, Rapid Traverse to Quill, coolant system and reversing motor for tapping.

Ask for Fosmatic Jig Borer Bulletin, JB-M.

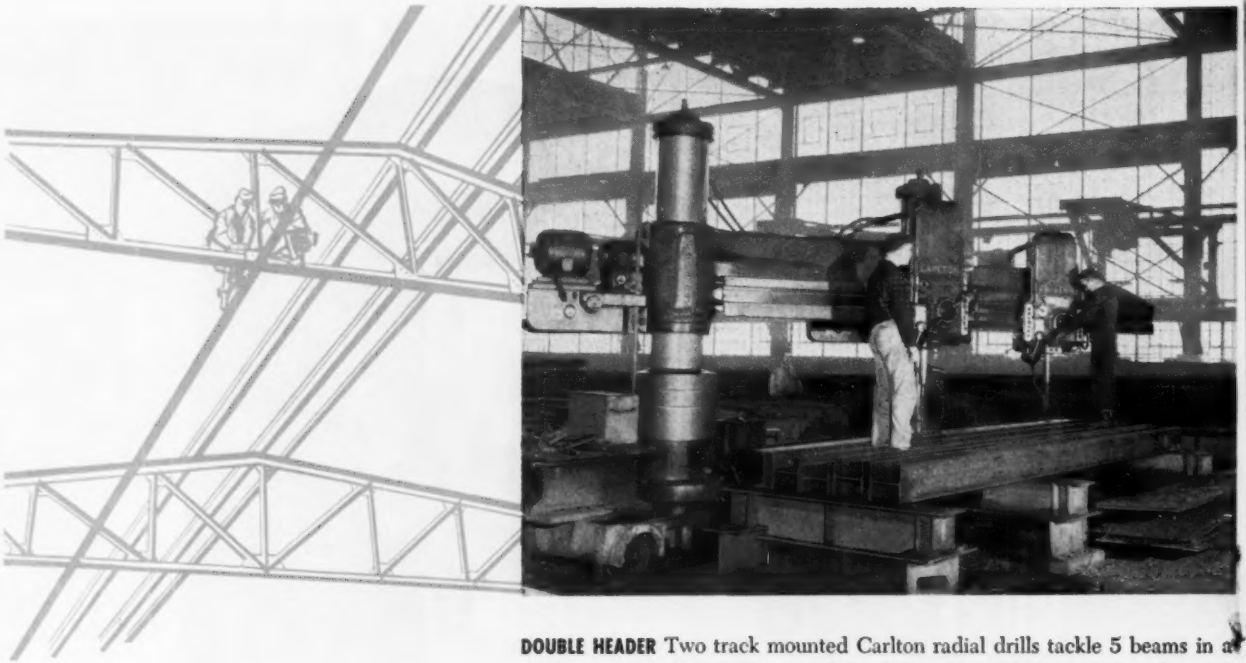




NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

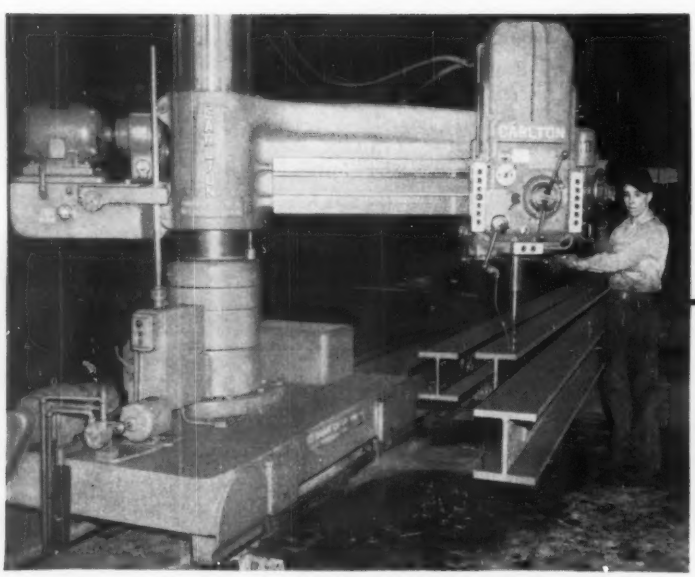
FOSDICK

THE FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO



DOUBLE HEADER Two track mounted Carlton radial drills tackle 5 beams in a single set-up at Harris Structural Steel Co., New Market, N. J., where 11 other Carlton radial drills are also used for this important hole production.

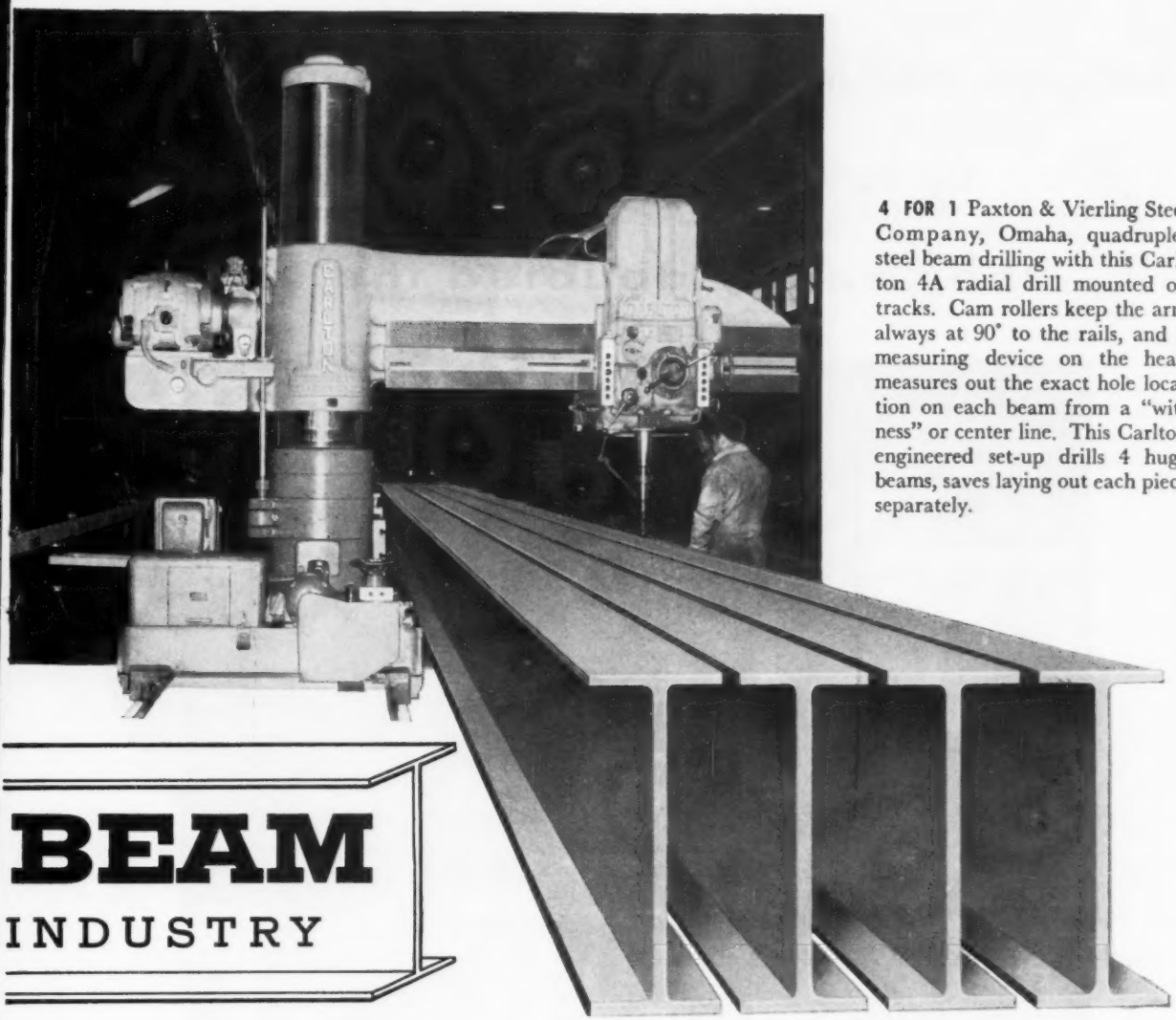
CARLTON'S on the
IN THE STRUCTURAL STEEL



Mobility, king size and engineering skill have made Carlton the leading radial drill in the structural steel industry. Special track mounting takes Carlton's drilling facilities up and down the entire length of even the longest beam. And Carlton's long arm reaches out over several beams.

In addition, Carlton has engineered several ingenious and inexpensive devices which make

MOHAMMED GOES TO THE MOUNTAIN It's smarter, easier and cheaper to bring the drill to the beams. And the Carlton radial drill on wheels is just the machine tool for the job. Drills through this heavy steel beam like so much cheese . . . and there's plenty of room for three or more beams under the long Carlton arm. Photo courtesy Ingalls Iron Works Co., Birmingham.



4 FOR 1 Paxton & Vierling Steel Company, Omaha, quadruples steel beam drilling with this Carlton 4A radial drill mounted on tracks. Cam rollers keep the arm always at 90° to the rails, and a measuring device on the head measures out the exact hole location on each beam from a "witness" or center line. This Carlton engineered set-up drills 4 huge beams, saves laying out each piece separately.

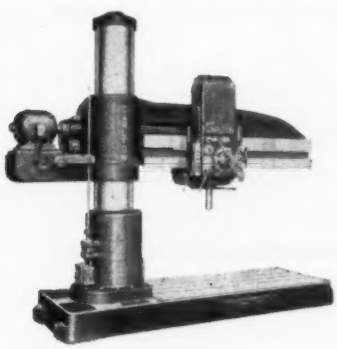
BEAM INDUSTRY

multiple beam drilling accurate, fast and practical.

Carlton brings every industry the advantage of

- a broad range of sizes: arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26".
- a choice of three speed-feed control systems: programming, preselector and manual.
- an exclusive combination of standard features at no extra cost: 3-unit power clamping, low-hung drive, positive tooth feed clutch, and easy, economical operation and maintenance.

There's a Carlton radial drill for every drilling requirement. Write for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton

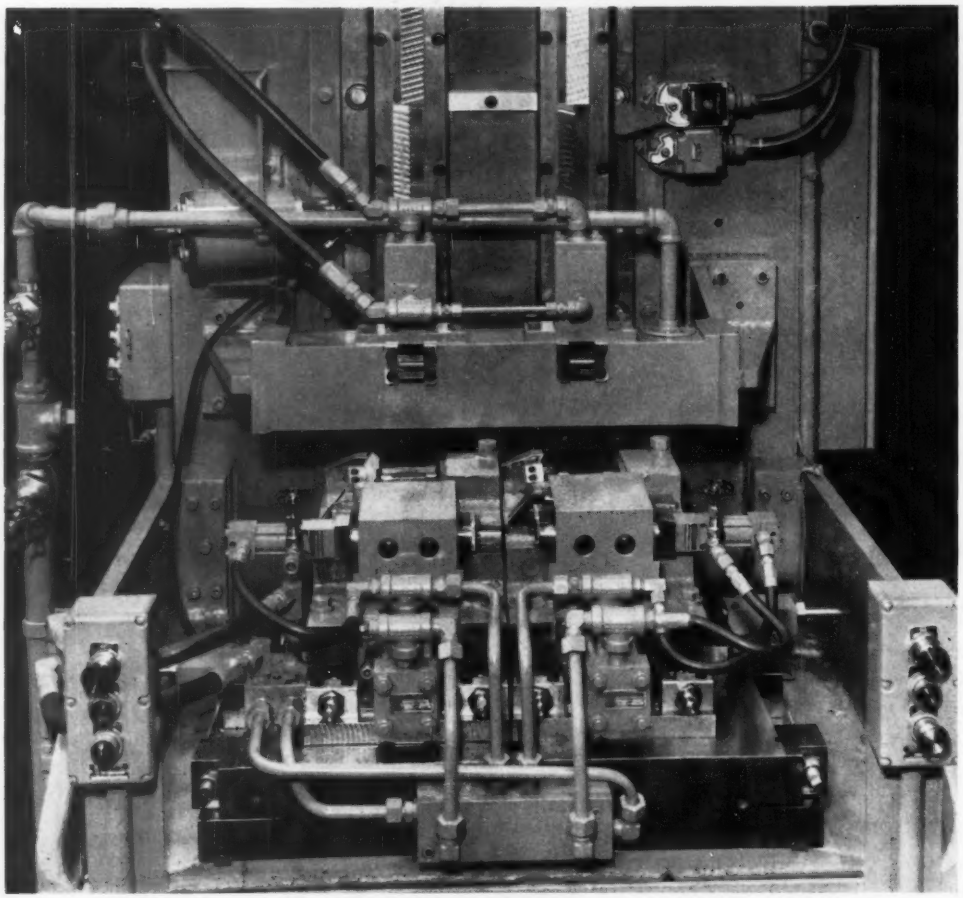
specialists in radial drills

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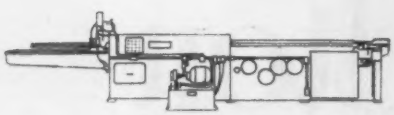
Although machining exceedingly tough material,

by converting to modern LAPOINTE

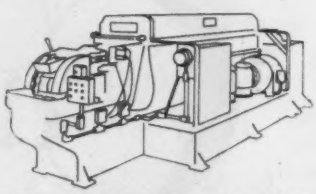
they easily doubled the former



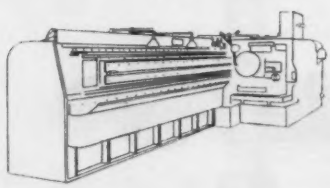
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



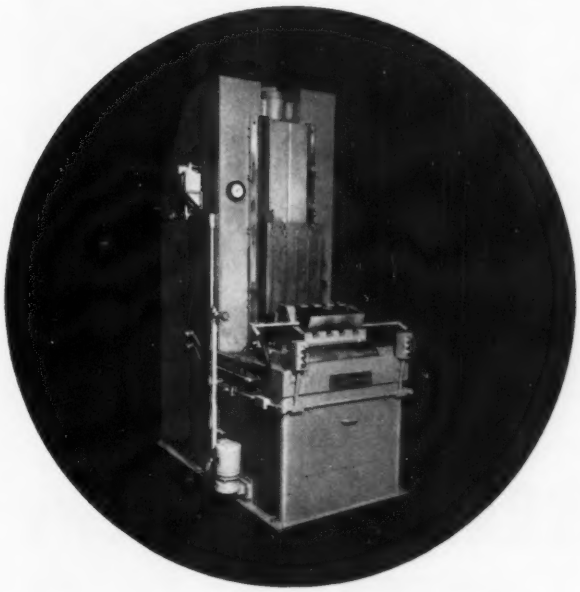
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

-BROACHING

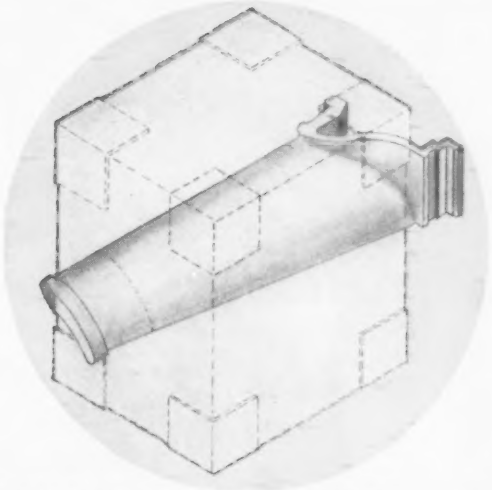
production rate!



The LAPOINTE 10-ton Single Ram Vertical Broaching Machine broaches these Turbine Vanes 2-at-a-time, removing .080" on each surface of the small buttress end. The part is cast in a shuttle block for holding, and location is taken off the block as well as the vane.

The fixture is the Lapointe-built In-and-Out type, having the entire top open for ease of loading and unloading.

This popular, versatile machine comes in ten sizes: 3- to 25-ton capacity, 30- to 90-inch stroke.



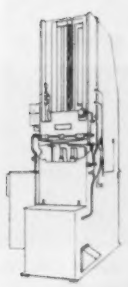
Everybody knows that Hastelloy "C" is one of the toughest alloys to work with . . . you don't exactly cut through it like a hot knife cuts through butter.

But here's a Turbine Vane, precision cast in Hastelloy "C", that is now being Lapointe-Broached on the buttress end at the rate of 192 parts per hour (at 80% efficiency) — using high speed steel Lapointe-made Broaches. They tell us that this is *twice* the production they were getting before converting to Lapointe-Broaching from their previous machining methods!

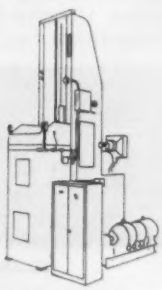
Maybe you've got a production problem in your shop, too . . . most everybody has. If so, it's just possible that a Lapointe Field Engineer could help you solve that problem! Why don't you invite him to talk with you about Lapointe-Broaching?

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

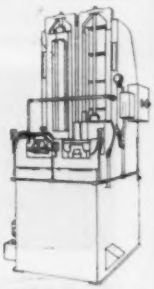
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC

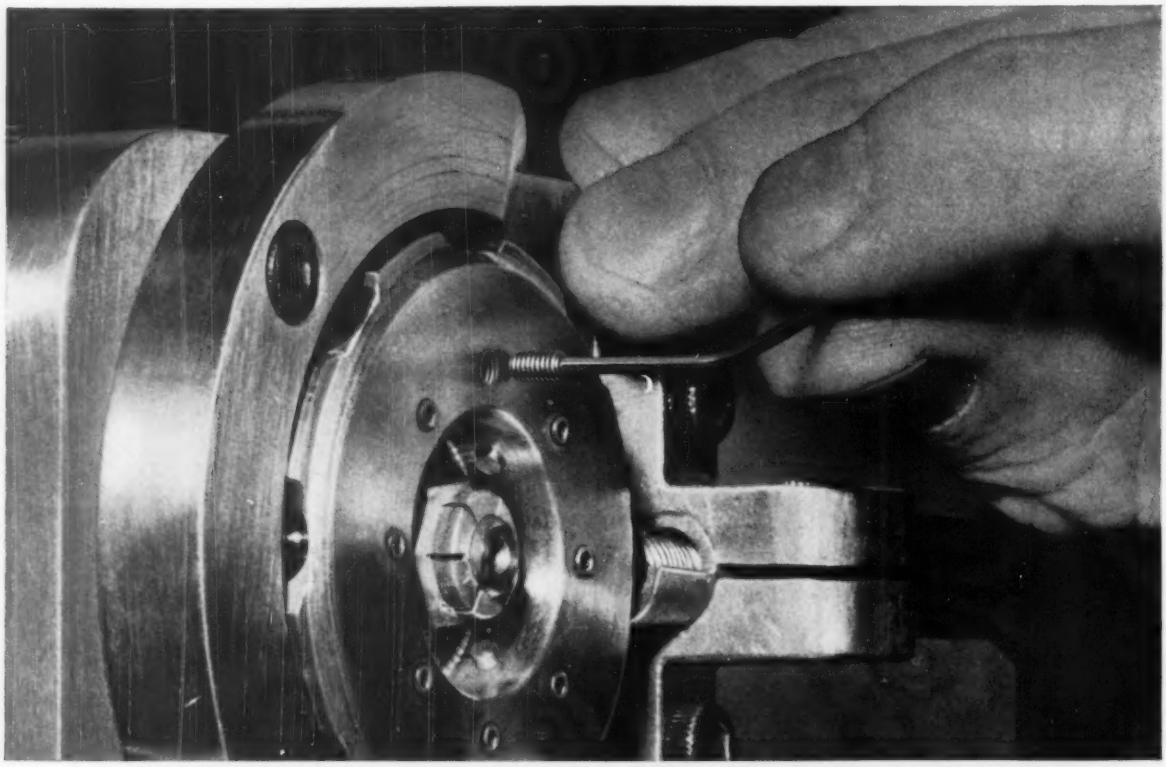


DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



Microsize UNBRAKO socket screws simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

Miniaturize with UNBRAKO set screws

HEAT-TREATED ALLOY STEEL*
PLAIN CUP POINT
Class 3 Fit Standard

Diameter		Threads per inch NC	Threads per inch NF	L Overall Length	Recommended Installation Torque in Inch-Pounds NC	Recommended Installation Torque in Inch-Pounds NF	Weight per Box of 100 in Pounds
#0	D .060 F .028	..	80	1/16	..	.5	.01
		..	80	3/32	..	.5	.01
		..	80	1/8	..	.5	.01
		..	80	5/32	..	.5	.01
		..	80	3/16	..	.5	.01
		..	80	1/4	..	.5	.01
#1	D .073 F .035	..	72	1/16	..	1.5	.02
		..	72	3/32	..	1.5	.02
		.	72	1/8	..	1.5	.02
		.	72	5/32	..	1.5	.02
			72	3/16	..	1.5	.02
			72	1/4	..	1.5	.02
#2	D .086 F .035	56	..	1/16	1.5	..	.03
		56	..	3/32	1.5	..	.03
		56	..	1/8	1.5	..	.03
		56	..	5/32	1.5	..	.03
		56	.	3/16	1.5	..	.03
		56	.	1/4	1.5	..	.03
#3	D .099 F .050	48	..	3/32	5.0	..	.04
		48	.	1/8	5.0	..	.04
		48	..	5/32	5.0	..	.04
		48	..	3/16	5.0	..	.04
		48	..	1/4	5.0	..	.04

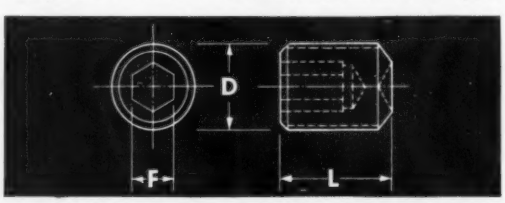
*Also available in stainless steel



You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

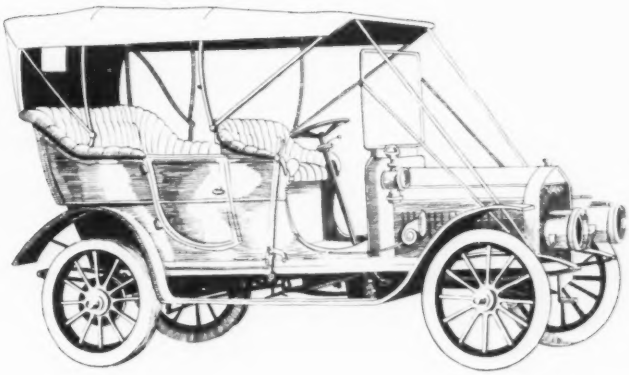
UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

Ask your authorized industrial distributor about microsize UNBRAKO socket screws today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

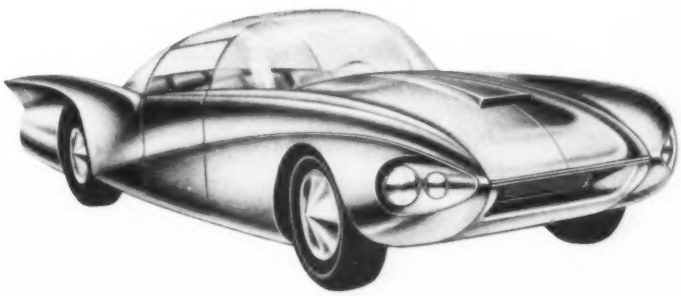


STANDARD PRESSED STEEL CO.
UNBRAKO SOCKET SCREW DIVISION SPS
JENKINTOWN PENNSYLVANIA

Great in its day...



BUT WOULDN'T YOU
RATHER HAVE THE LATEST
TECHNICAL ADVANCE?





Heller announces a great

nucut

"Job Tempered" Hack Saws

Certified by American Standards Testing Bureau to meet their Standards for Superior Cutting: Uniform Teeth . . . Uniform Set . . . Uniform Temper.*

An exciting development in the tool field has been achieved by Heller with the perfection of JOB TEMPERING. This significant new advance in tool metallurgy and heat treatment has now been applied to a great new line of Heller Tools!

Developed after long metallurgical research and based on years of experience in producing superior metalworking tools . . . JOB TEMPERING results in tools that perform better and longer on the toughest jobs in the shop.

As a result, every Heller Hack Saw Blade is certified by American Standards Testing Bureau* to meet the three important requirements for superior cutting on the job: *Uniform Teeth, Uniform Set* and *Uniform Temper.*

Heller offers a complete line of JOB TEMPERED hack saws for both hand frame and power machine use.



Hand Blades:

Available in standard steel, high speed "M"-HAX and high speed "T"-HAX. All-Hard or Flexible Hard-Edge. Furnished in all standard lengths and tooth spacings. Packed in lots of 100 in attractively designed package.

Power Blades:

Available in high speed "M"-HAX, high speed "T"-HAX and shatterproof "NUWELD". Full range of sizes, widths, and tooth spacings. Packed in lots of 10 blades in an attractive newly designed package.

Give us your toughest hack sawing problem.

We'll be glad to show you how the remarkable new Heller JOB TEMPERED Blades can solve it efficiently and economically — delivering fast, straight, trouble-free cutting over longer periods.

HELLER TOOL CO. SINCE 1936

Heller



new advance in its tool

nucut

"Job Tempered"

Metal Cutting Band Saw Blades

Certified by American Standards Testing Bureau to meet their Standards for Superior Cutting: Uniform Teeth . . . Uniform Set . . . Uniform Temper.*

The fundamental advance in hack saw manufacture made possible by Heller's JOB TEMPERING process has also been applied to a complete new line of Heller Metal Cutting Band Saws.

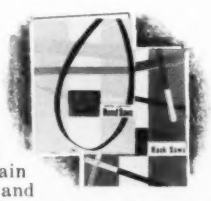
Special, controlled-analysis steel and Heller's unique heat-treating formula are combined with precision tooth contour and uniform set. The result: band saw blades that provide superior cutting and longer service on the toughest jobs.

Heller JOB TEMPERED Hard-Edge Blades are offered in all tooth shapes . . . Standard, (Regular or Wavy Set), Skip and Hook Tooth designs. High Speed Steel band saw blades are also furnished for specific applications.

Saws are available in all standard widths and tooth spacings . . . in 100′ and 250′ coils *or* welded to exact machine length ready to use.

Give us your toughest band sawing problem.

We'll be glad to show you how the *right* Heller JOB TEMPERED Blade will solve it efficiently, economically and give you faster, smoother cutting and longer life.



Here are the facts!

Heller's Catalogs on Hack Saw and Metal Cutting Band Saw Blades contain full information on types, sizes, widths and thicknesses of saws, tooth shapes and sets, types of steel, etc., that will help you solve your cutting problems. WRITE TODAY FOR YOUR FREE COPIES.

* AMERICAN STANDARDS TESTING BUREAU INC. S TB

Tool Co.

AMERICA'S OLDEST FILE MANUFACTURER

NEWCOMERSTOWN, OHIO

tool line...

nucut

"Job Tempered"

Flat Ground Die Steel

Oil and Air Hardening Types

The Analysis Recommended by Leading Consulting Metallurgists

The metallurgical research that produced Heller's exclusive JOB TEMPERING process for their full line of tools has resulted in the development of truly superior Flat Ground Die Steel.

Here is a die steel analysis recommended by leading consulting metallurgists. It has excellent machining characteristics before heat treating. And when tempered according to Heller's simple Heat Treating Instructions, results in a true JOB TEMPERED tool or die that will give superior performance on the job.

Heller Die Steel is available in both Oil Hardening and Air Hardening types, precision ground to a finish of 25-35 micro-inches with all decarburization and surface defects removed.

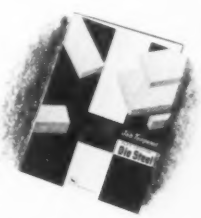
Oil Hardening type flats and squares are furnished in standard lengths of 18″ and 36″ and in a full selection of widths ranging from $\frac{1}{2}$″ to 14″ and from 1/64″ to $1\frac{5}{8}$″ thick. All sizes are individually packaged and include full heat treating instructions.

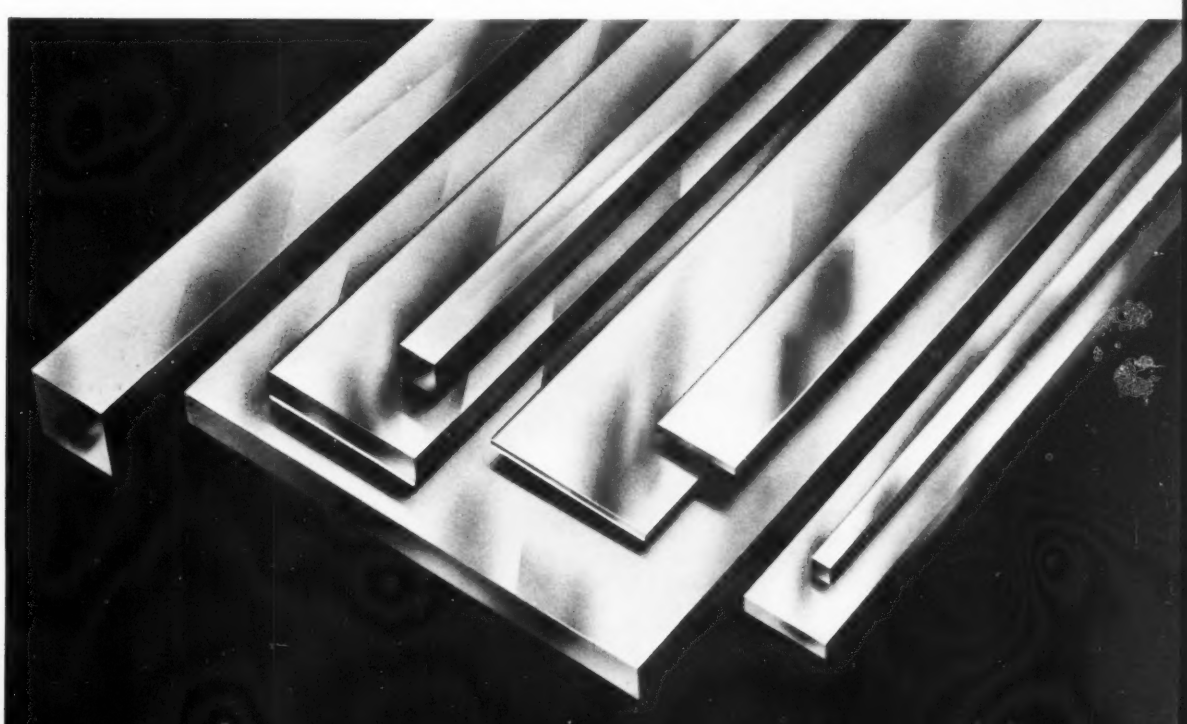
Air Hardening type flat and square sizes are available in standard 36″ lengths only, in thicknesses from $\frac{1}{8}$″ to 2″, and in widths from 1″ to 10″. All sizes are individually packaged and include full heat treating instructions.

Special sizes of both types are also available on order.

Here are the facts!

Complete information on sizes, tolerances, chemical analysis and heat treatment is contained in this new Heller Nucut Flat Ground Die Steel Catalog. WRITE TODAY FOR YOUR FREE COPY.





A GREAT NEW ADVANCE
IN TOOL TECHNOLOGY
BY

Heller...

"Job Tempered"

Tools



NUCUT
American Pa
with exclusiv

NOW "Job Tempered"

NUCUT® AMERICAN PATTERN FILES WITH EXCLUSIVE "WAVY-TEETH"

AMERICAN-SWISS® SWISS PATTERN FILES

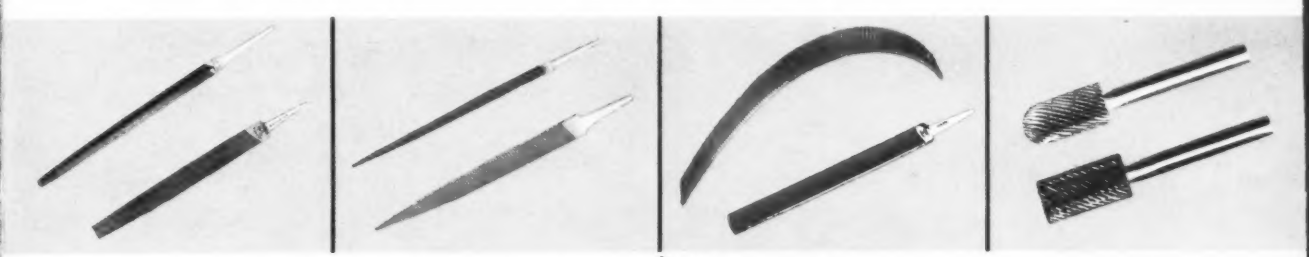
VIXEN® MILLED CURVED-TOOTH FILES

ROTARY FILES AND CARBIDE BURRS

Now Heller announces JOB TEMPERED FILES . . . the most significant forward step in file making since the development of Heller's exclusive "Wavy-Teeth" principle!

JOB TEMPERING combines the latest Heller metallurgical developments with special production techniques. The result of this new advance shows right up in *job performance* . . . superior cutting ability, better finish on the work and longer file life in the most severe service.

You'll get better results and cut your filing costs if you select the right file for the job from the famous Heller NUCUT American Pattern Files with exclusive "Wavy-Teeth"; AMERICAN-SWISS Swiss Pattern Files; VIXEN Milled Curved-Tooth Files; and HELLER Rotary Files and Burrs . . . and satisfy *all* your requirements for truly superior files.



A Complete Line of "Job Tempered" Files

NUCUT
American Pattern Files with exclusive "Wavy-Teeth"

AMERICAN-SWISS
Swiss Pattern Files

VIXEN
Milled Curved-Tooth Files

ROTARY FILES and CARBIDE BURRS

Here are the facts!

HELLER'S catalog gives full information on available types, sizes, cuts, shapes, and patterns. WRITE TODAY FOR YOUR FREE COPY!



SOLD EXCLUSIVELY THROUGH

Heller DISTRIBUTORS
"YOUR OUTSIDE TOOL ROOM"

Heller "Job Tempered" Tools

Heller Tool Co.

AMERICA'S OLDEST FILE MANUFACTURER

NEWCOMERSTOWN, OHIO

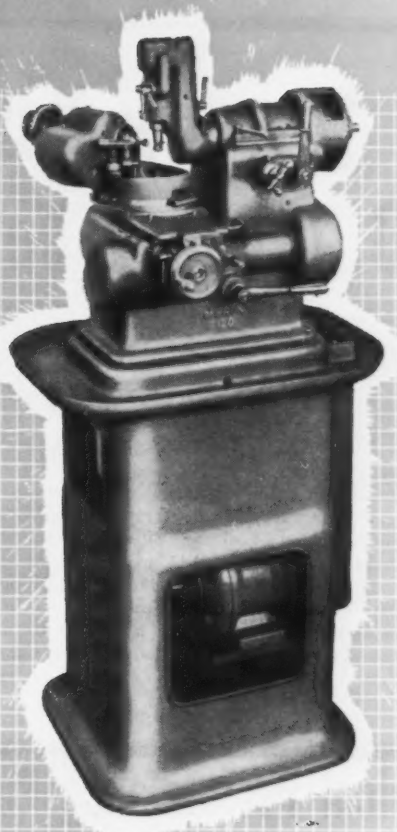
A Subsidiary of Simonds Saw and Steel Co.



THE ULTIMATE IN

BEVEL GEAR ACCURACY





- low-cost tooling
- simplicity of set-up

NO. 120 MIKRON

fine pitch

BEVEL GEAR HOBBING MACHINE

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

For more information fill in page number on Inquiry Card, on page 239

Users tell you . . .

How Norton wheels cut O.D. grinding costs and improve quality

Here's the "Touch of Gold" to give your cylindrical and centerless grinding great advantages

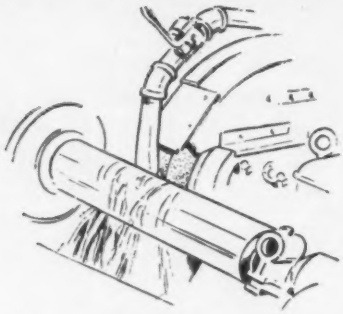
Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per wheel and dressing . . . easier dressing, with less wear on diamond or crushing roll.

Those are typical benefits reported by Norton G Bond and BE Bond wheel users all over the country — concerning every type of O.D. grinding.

It's all because both G Bond and BE Bond are so particularly well adapted to the needs of cylindrical and centerless grinding. Wheels made with them hold each abrasive grain just long enough for maximum cutting action — and outperform all other wheels in many grinding operations, precision or semi-precision. The new Norton "44" ALUNDUM abrasive is proving to be the most outstanding non-premium-priced abrasive for many O.D. grinding jobs.

Here we can show just a few of the on-the-job photos and facts passed on to us. Look them over — and note how these wheels can add the "Touch of Gold" that will boost your own product quality and profits.

Typical Performance Reports on "44" ALUNDUM* Abrasive

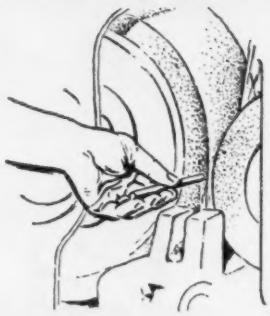


CYLINDRICAL GRINDING

A WISCONSIN PLANT, grinding 2″ to 4″ diameter steel shafts, 12″ length, reports 44 ALUNDUM wheels (44A54-KVBE) cut faster and cooler with no sacrifice of wheel life, compared with best previously used wheels.

A MICHIGAN PLANT, grinding miscellaneous high speed steel bolt heading dies finds 44 ALUNDUM wheels best. Reasons are more pieces per dressing, cooler cutting action and 30% longer wheel life than formerly used wheels.

A NEW JERSEY PLANT found a 44 ALUNDUM wheel (44A36-MVBE), plunge grinding different steel parts, gave many more pieces per dressing and averaged 15% longer life than wheels they used before.



CENTERLESS GRINDING

A MICHIGAN PLANT, of the smaller jobbing types, grinding all kinds of materials. They prefer 44 ALUNDUM wheels (44A801-NVBE) for versatility, less dressing and faster cutting — including 10-hour completion of a job which used to take 14 hours.

AN OHIO PLANT removes .008″ on the rough grind and .003″ on the semi-finish grinding of No. 1010 steel crankshaft pins, ¾″ diameter x 4″ length. While standard wheels gave them an average of 600 pieces per dressing, they report a 44 ALUNDUM wheel produced 1,000 pieces, by retaining its sharp cutting face longer. All stock was removed in one pass, compared with two passes formerly required.

ANOTHER MICHIGAN PLANT, of large size, tested a 44 ALUNDUM wheel in grinding hardened steel tappets. They report more pieces per dressing, faster cut and less burn than ever obtained before.



"G BOND WHEELS LAST US UP TO 40% LONGER," reports this centerless grinding customer. He found that wheel life increased profitably because this greatly improved vitrified bond breaks down so evenly. Workpieces are tapered shank vanadium steel spindles, 10" long with ¼" diameter — plunge ground to remove an average of .045".



"WE NOW GET 800 PIECES PER DRESSING with G Bond wheels, as against 500 pieces with previous wheels. Also, we get 50% longer wheel life, a finer finish, and the shoulder holds up much better." That's the report on this plunge-cut centerless grinding job. Work is a ¼" diameter, 1" long stud from which .012" is removed, to .0005" tolerance and 20 microinch finish.



"WE INCREASED PRODUCTION RATE 35% with G Bond wheels, besides greatly improving finish." These valuable "Touch of Gold" advantages are reported on a cylindrical grinding job calling for .025" stock removal from stainless steel tubing. The operation is also on a Norton machine — a reminder that only Norton offers you such long experience in both grinding machines and grinding wheels, to help you produce more at lower cost.

ASK YOUR NORTON DISTRIBUTOR

for further proof of how Norton O.D. wheels can bring you best possible results. He'll gladly arrange a test in your plant. Distributors in all industrial areas listed under "Grinding Wheels" in the yellow pages of your telephone book. Behr-Manning Division, Troy, New York. *Export:* Norton Behr-Manning Overseas, Inc. **For information write Norton Company, Worcester 6, Mass.**

W-1772

NORTON

ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS:
Coated Abrasives • Sharpening Stones
Behr-cat Tapes

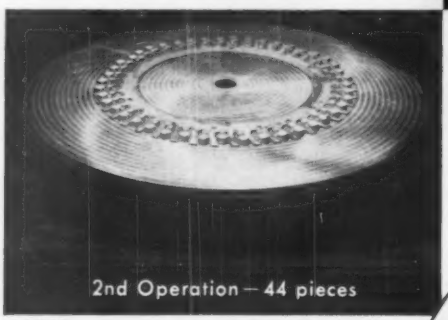
*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

Another example



1st Operation—653 pieces

W-1138



2nd Operation—44 pieces

W 1139

of Blanchard versatility



No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

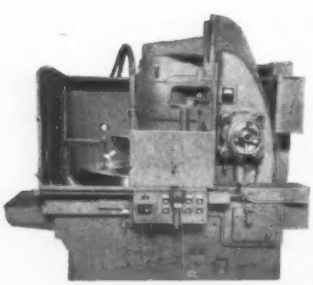
Blanchard Surface Grinders are noted for their unusual versatility—like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours—including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ±.003. Each load takes eight minutes—floor-to-floor.

As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard—whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition—recently revised.

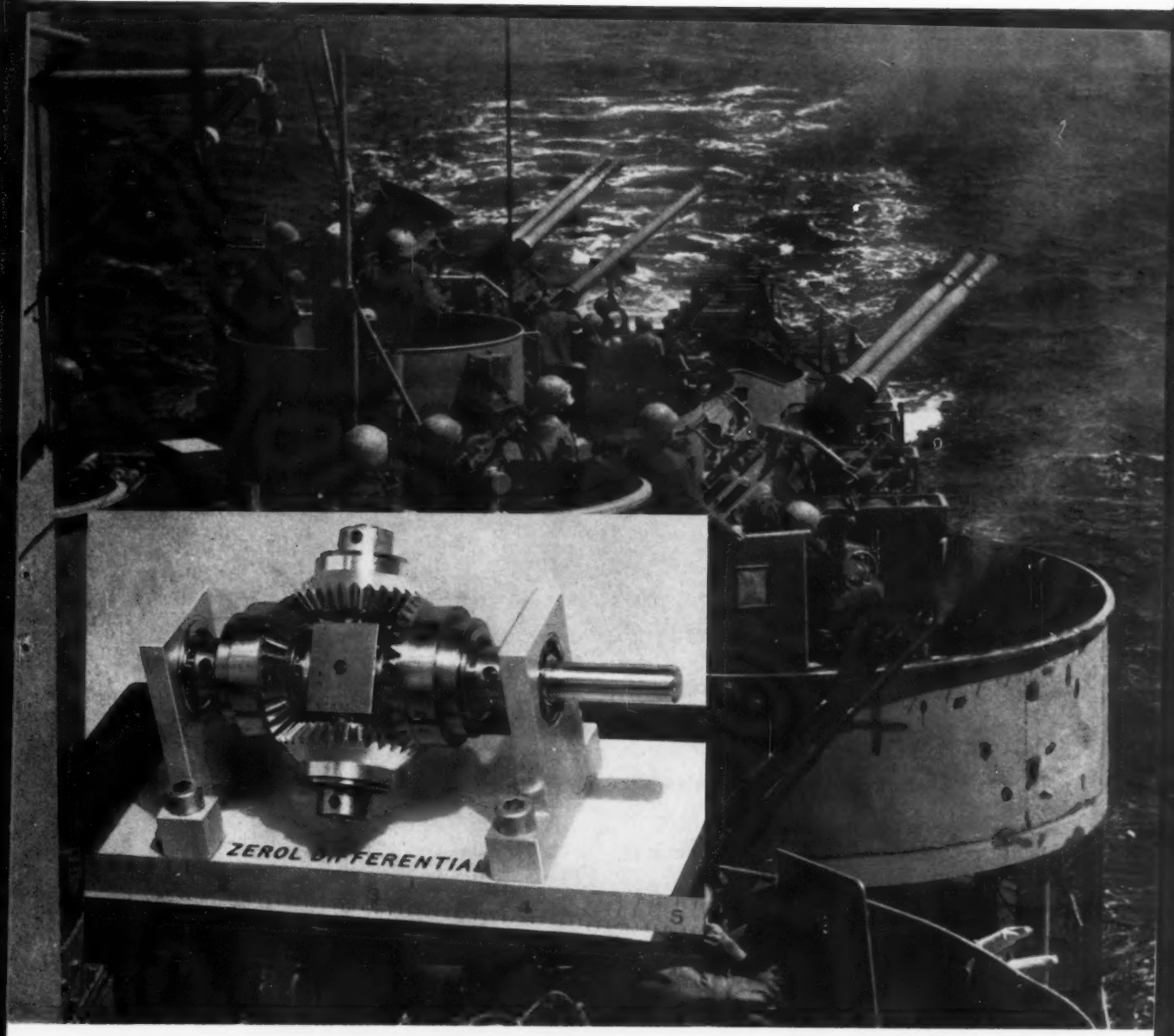


PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

For more information fill in page number on Inquiry Card, on page 239



Official United States Navy Photograph

When your fine pitch gears *must be accurate*

When you work with fine pitch gears like those in this naval fire control unit differential, tolerances are critical.

Tooth-to-tooth accuracy is extremely important to permit the guns to be sighted precisely on target.

So where accuracy is really critical in the gears you make, Gleason can help you three ways:

1. Machines that cut or grind any fine pitch gear

You can produce any fine pitch gear—spiral bevel, hypoid, Zerol®, or Coniflex®—exactly and economically with any of five Gleason machines.

Three automatic gear-cutting generators cover the entire field of cut fine pitch bevel gears up to 4½" diameter. Two automatic, wet-type grinders are available for this same range of work and produce the ultimate in accuracy. All five work to your most rigid specifications.

2. Machines that test gears thoroughly

The Gleason No. 104 Hypoid Tester, for example, checks running qualities, tooth spacing, and concentricity of gears. It records test results on paper so that you have a permanent record of the total tooth-to-tooth composite error.

3. Engineering services

Gleason engineers are ready at all times to help you with any phase of the design and manufacture of fine pitch gears.

Simply write or phone for prompt assistance on any of your fine pitch gear requirements.

Send for these bulletins:

No. 2A Straight Bevel Coniflex® Generator
No. 103 Straight Bevel Coniflex® Generator
No. 2 Hypoid Generator
No. 105 Straight Bevel Coniflex® Grinder
No. 7 Hypoid Grinder
No. 104 Hypoid Tester

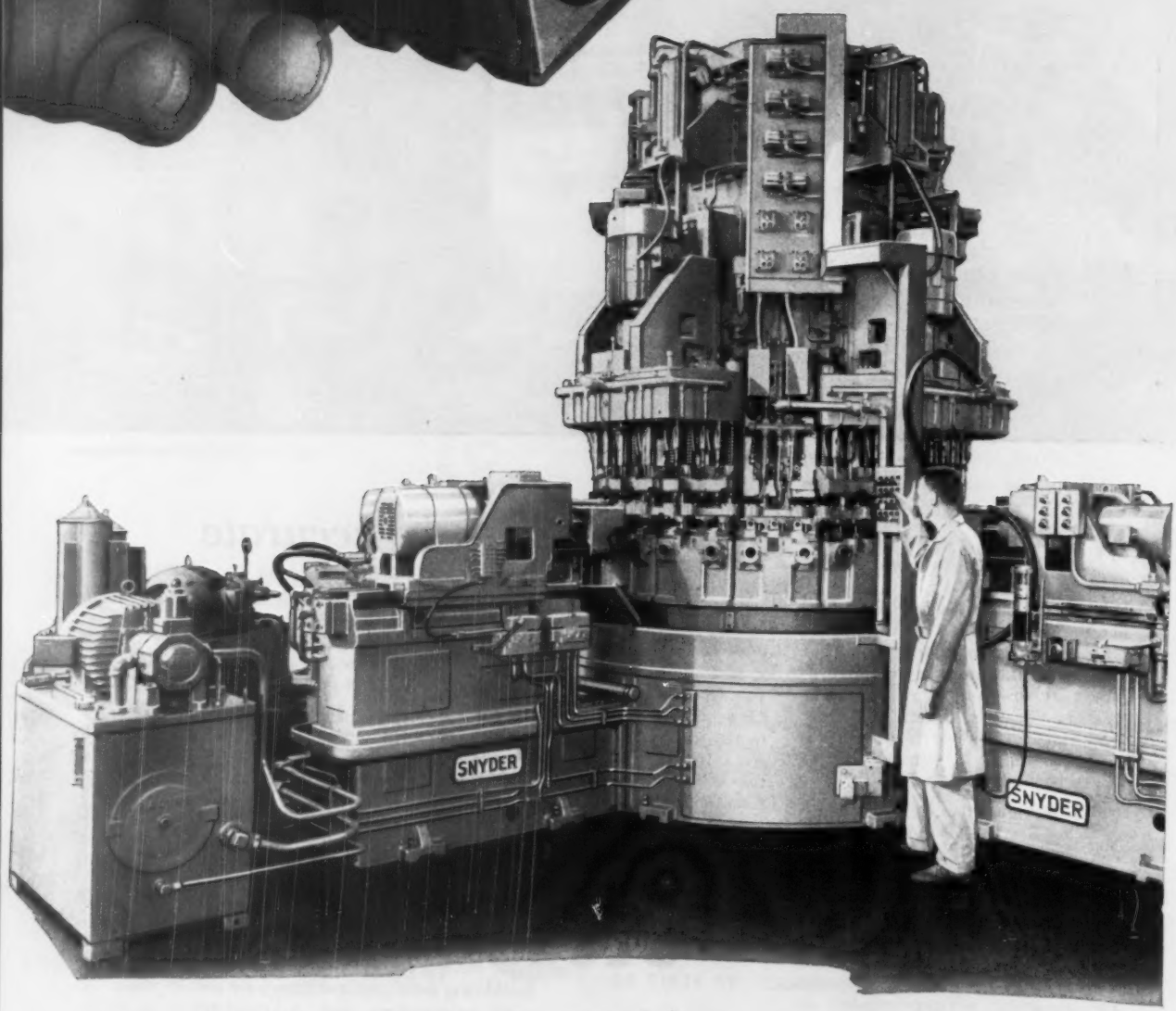
GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

Simplified Automation in
Successfully Applied in New





Machining Small Parts is Snyder Center Column Machine

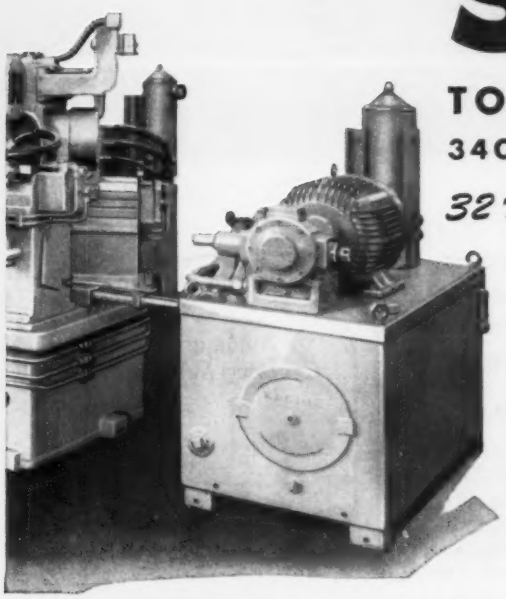
The principle of automation is inherent in the design of this machine which performs, in its continuous 16-station cycle, 25 operations equalling the performance of two or three ordinary machines. The workpiece is a small automotive steering gear ball nut 2½" x 1⅝" x 1⅞". Production is 331 pieces per hour.

Three workpieces are loaded and automatically clamped in each of the 16 fixtures on the 96" index table. A unique feature of the machine is its special heavy-duty cast iron center column 108" high and 48" in diameter. This massive column is necessary to withstand the high vertical thrust loads imposed by six heads mounting 9 spindles each which drill, flat bottom drill and radius chamfer four recirculating ball holes and tap drill and chamfer one hole in the same part face.

The table is also designed to withstand high horizontal thrust loads for core drilling, chamfering and reaming the threaded shaft hole which requires three spindles for each of the seven Snyder heavy-duty way type units.

The machine, one of the largest of its type, weighs 50,000 lbs., requires 288" x 312" floor space and stands 156" high overall.

If you have an automation problem in machining small parts, this type of Snyder machine may be the right answer.

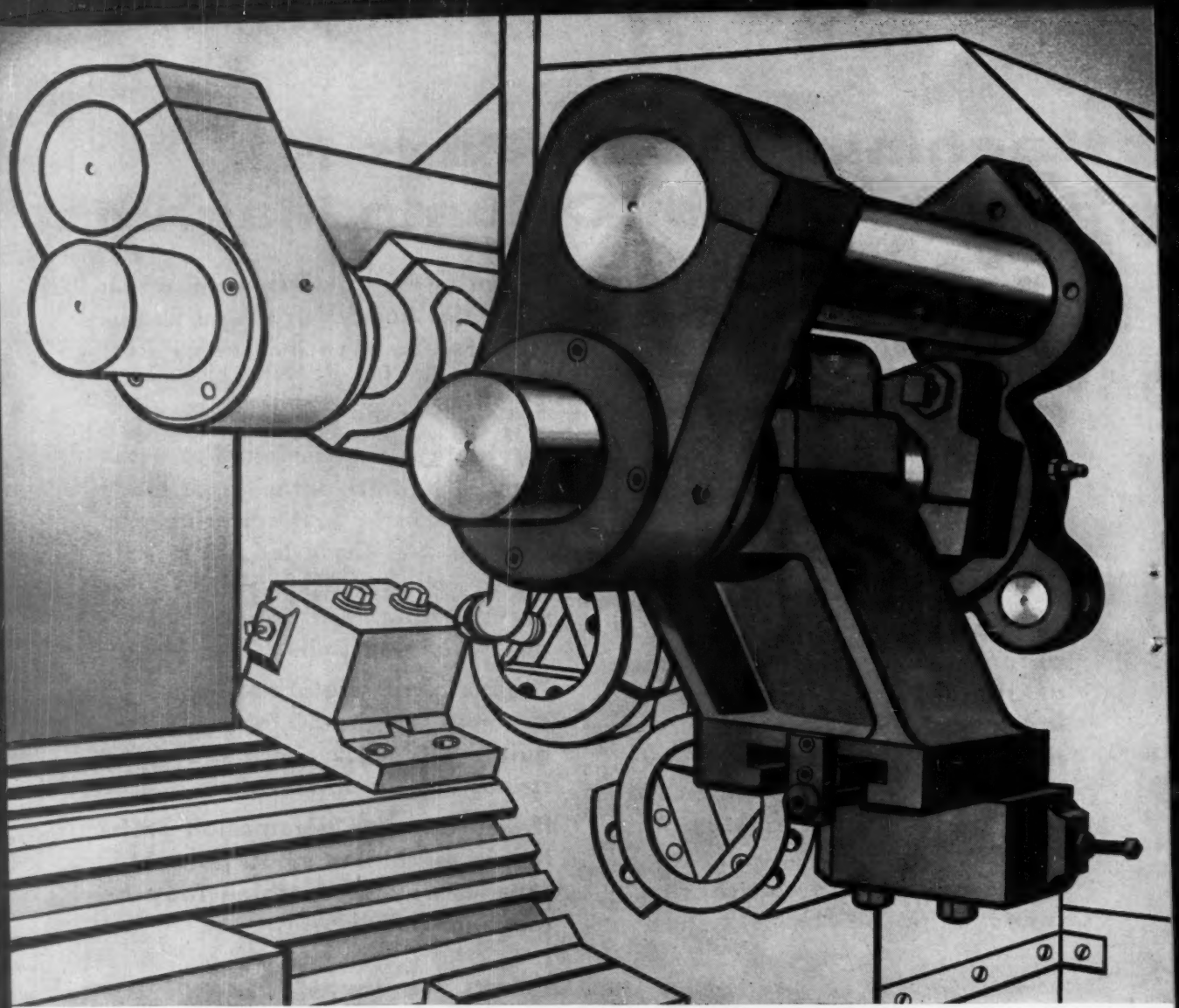


SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation



3 money-making advantages

from 1 exclusive New Britain feature

New Britain's exclusive swinging arms can do everything a cross slide can do, *and*:

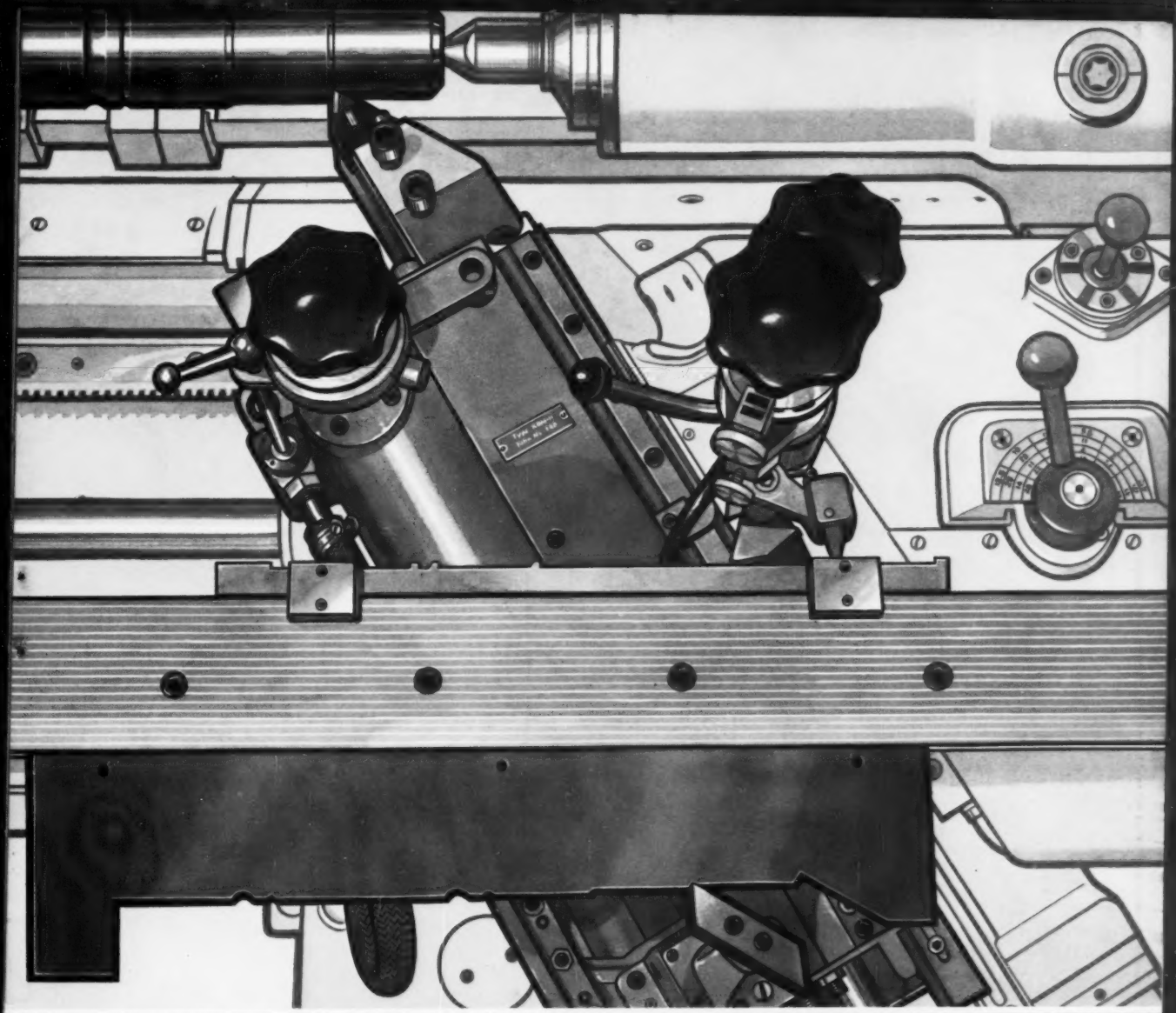
- You can position them for any length piece.
- You can turn O.D.'s and I.D.'s and faces with single point tools.
- You can *combine* transverse and longitudinal motions to turn tapers or radii and do recess boring.

Before you invest in automatics, check New Britains. Their "do more" principles can produce a greater return — often it's the difference between a single machining and the need for secondary operations. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

THE NEW BRITAIN MACHINE CO.

Automatic
Chucking Machine

NB



New Britain +GF+ outproduces multi-tool lathes with a single tool

How can one tool outproduce several? The answer is — maintain dimensional relationships with a template or prototype instead of a multi-tool setup. This cuts tool changeover time to practically zero.

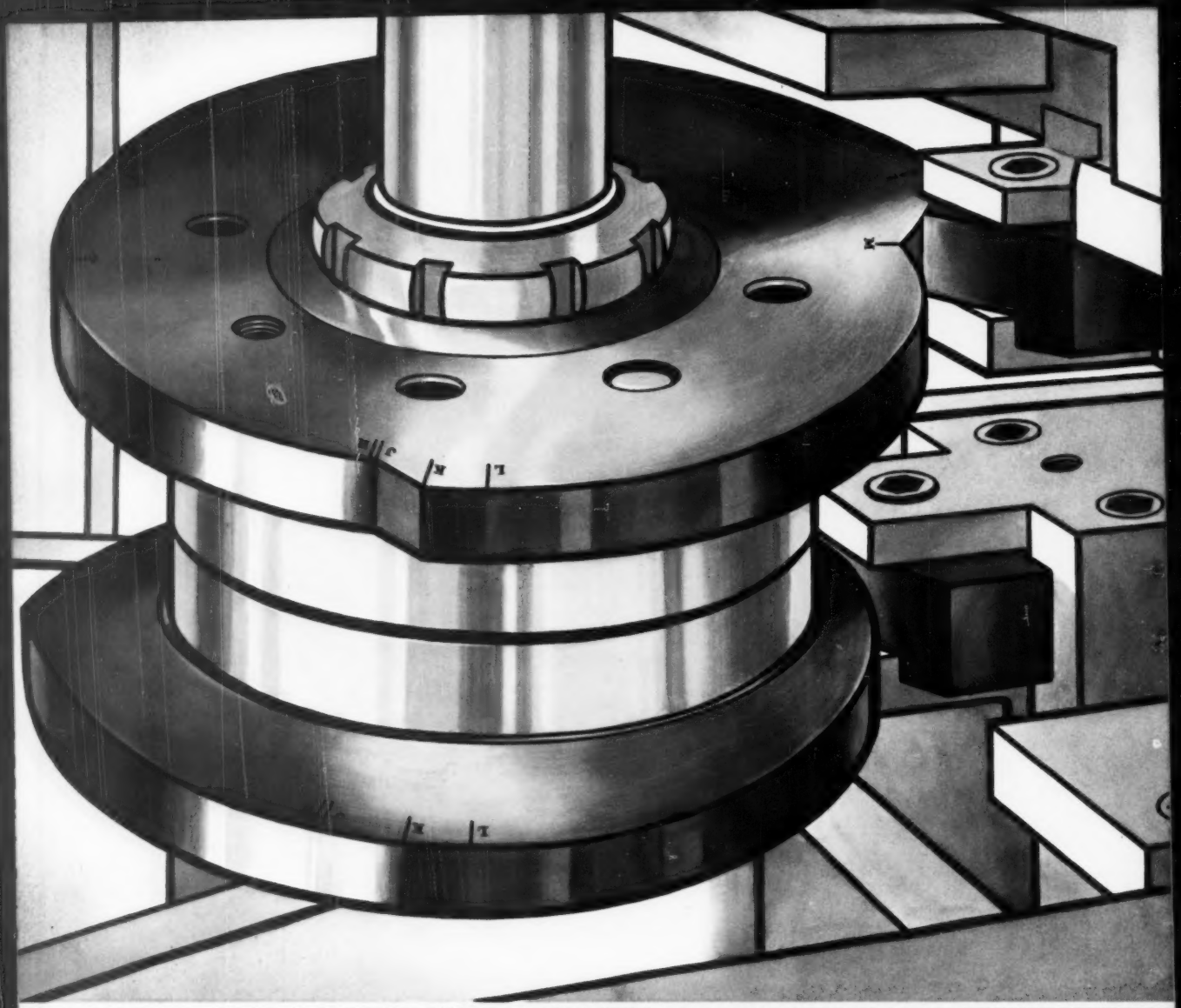
On the New Britain **+GF+** copying lathe, you can cut at maximum speeds and feeds for tool efficiency without worrying about tool wear and the delicate readjustment of several cutting tools. When the tool wears, change it, bring one dimension to size. The other dimensions have to be right. Your choice of a New Britain **+GF+** means elimination of any extra operation to bring pieces within grinding tolerances.

Machines from New Britain's three machine tool divisions incorporate the *basic principles* of more profitable production.

THE NEW BRITAIN MACHINE CO.

New Britain +GF+
Copying Lathe

NB

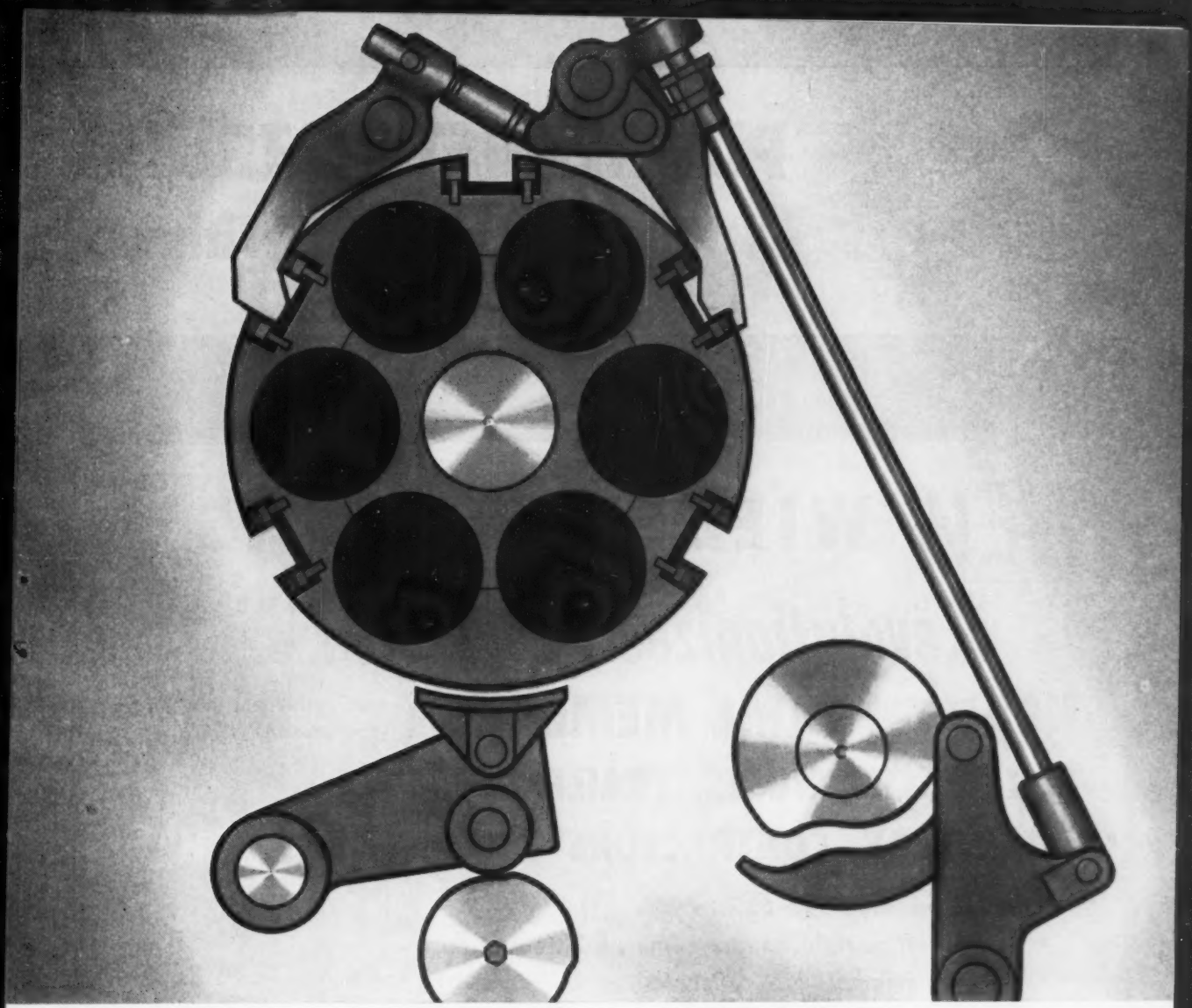


cams put the precision in precision boring

When you are working to "tenths" cams are your best method of maintaining accuracy, because cam control of the tool is *positive* control. The accuracy of parts produced on New Britain boring machines *can't* be affected by variable hydraulic pressures, ambient temperature, or play in complicated linkages.

In boring machines or *any* machine tool investment, be sure your most important requirements are met, not by gadgets, but by the fundamental design principles employed. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

THE NEW BRITAIN MACHINE CO.
Precision Boring Machine
NB



heavier, faster cuts

with accuracy

This cross section of a New Britain spindle carrier illustrates three features that assure permanent accuracy under today's constant heavy duty use.

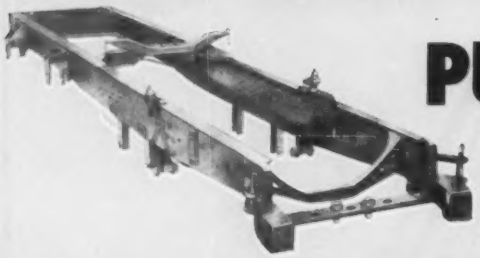
1. Positive, accurate location of the carrier means perfect spindle alignment with the tool.
2. Rigid clamping of the carrier makes it integral with the frame during the cutting cycle, eliminating carrier weave and vibration.
3. Automatic spindle carrier lifting mechanism eliminates all wear during indexing, and so guarantees preservation of initial accuracy.

Features like these don't show on the surface — you "see" them in the form of continued accurate production, year after year. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

THE NEW BRITAIN MACHINE CO.

Automatic Bar Machine

NB



PUNCH CUSTOM TRUCK

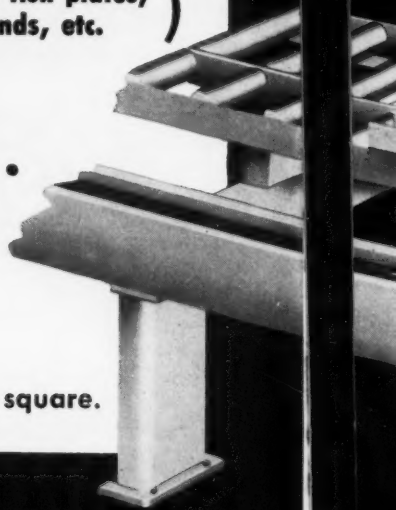
Without Layout • Without

NEW WIEDEMANN R-152

Revolutionizes Production of

HEAVY FRAME MEMBERS (side rails, fish plates, wrap-arounds, etc.)

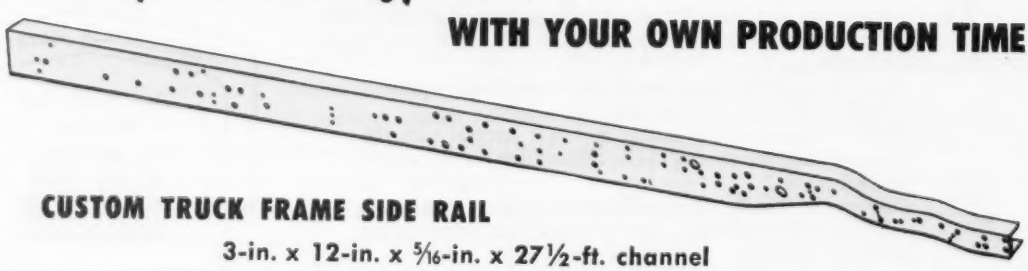
FOR TRUCKS, BUSES, TRAILERS, ROAD MACHINERY, CONTRACTORS' EQUIPMENT . . .



- Cuts production time 60% to 90%
- Pierces left or right hand members with equal ease
- Handles members of any length
- Mechanical positioning of work piece eliminates layout
- 20 stations in turrets carry punches up to 3-in. diameter or 3-in. square.

Compare This Typical Job

WITH YOUR OWN PRODUCTION TIME



CUSTOM TRUCK FRAME SIDE RAIL

3-in. x 12-in. x 5/16-in. x 27½-ft. channel

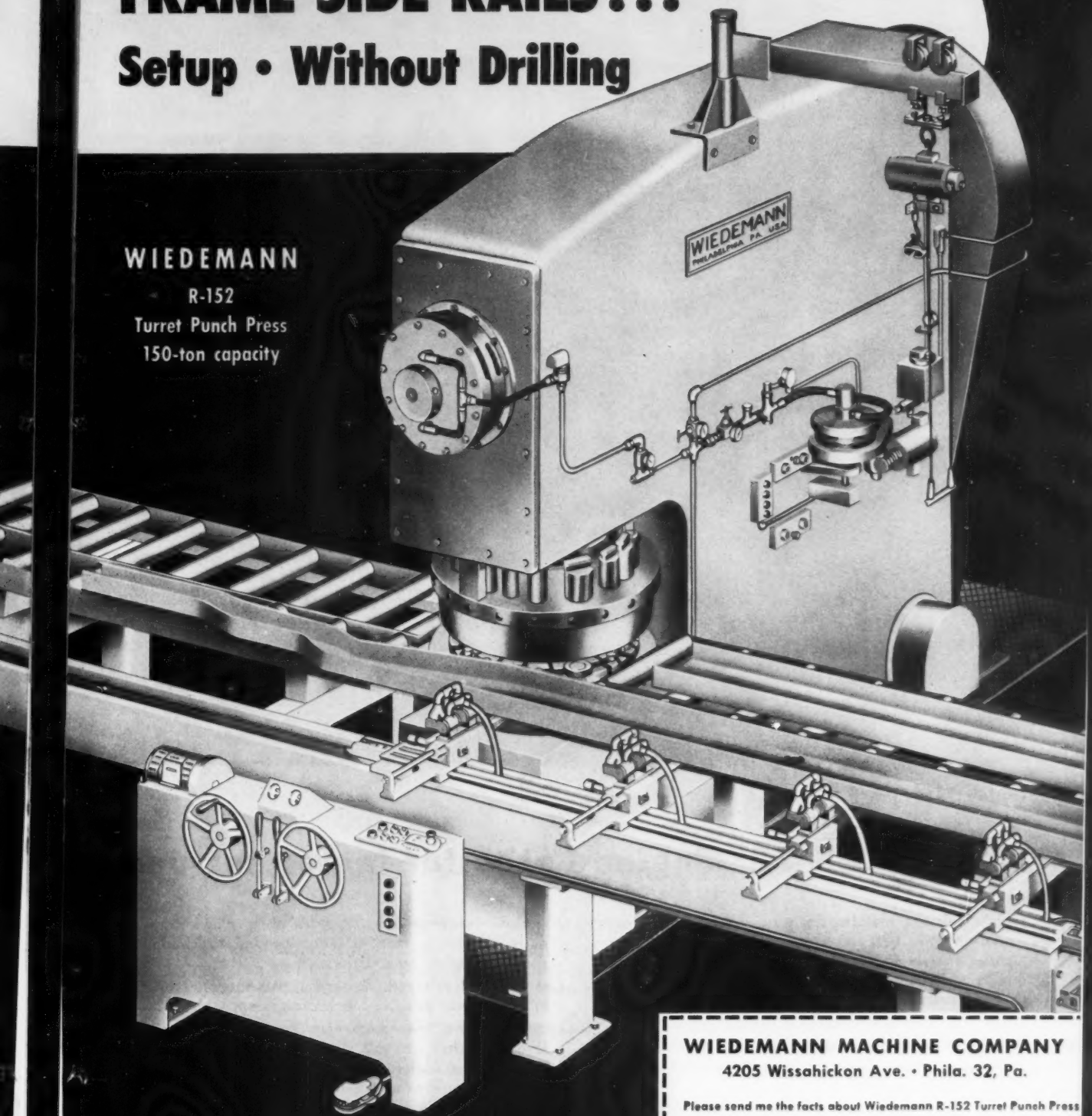
106 holes 16 hole sizes

18.5 MINUTES FLOOR TO FLOOR

FRAME SIDE RAILS...

Setup • Without Drilling

WIEDEMANN
R-152
Turret Punch Press
150-ton capacity



WIEDEMANN
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WIEDEMANN MACHINE COMPANY
4205 Wissahickon Ave. • Phila. 32, Pa.

Please send me the facts about Wiedemann R-152 Turret Punch Press

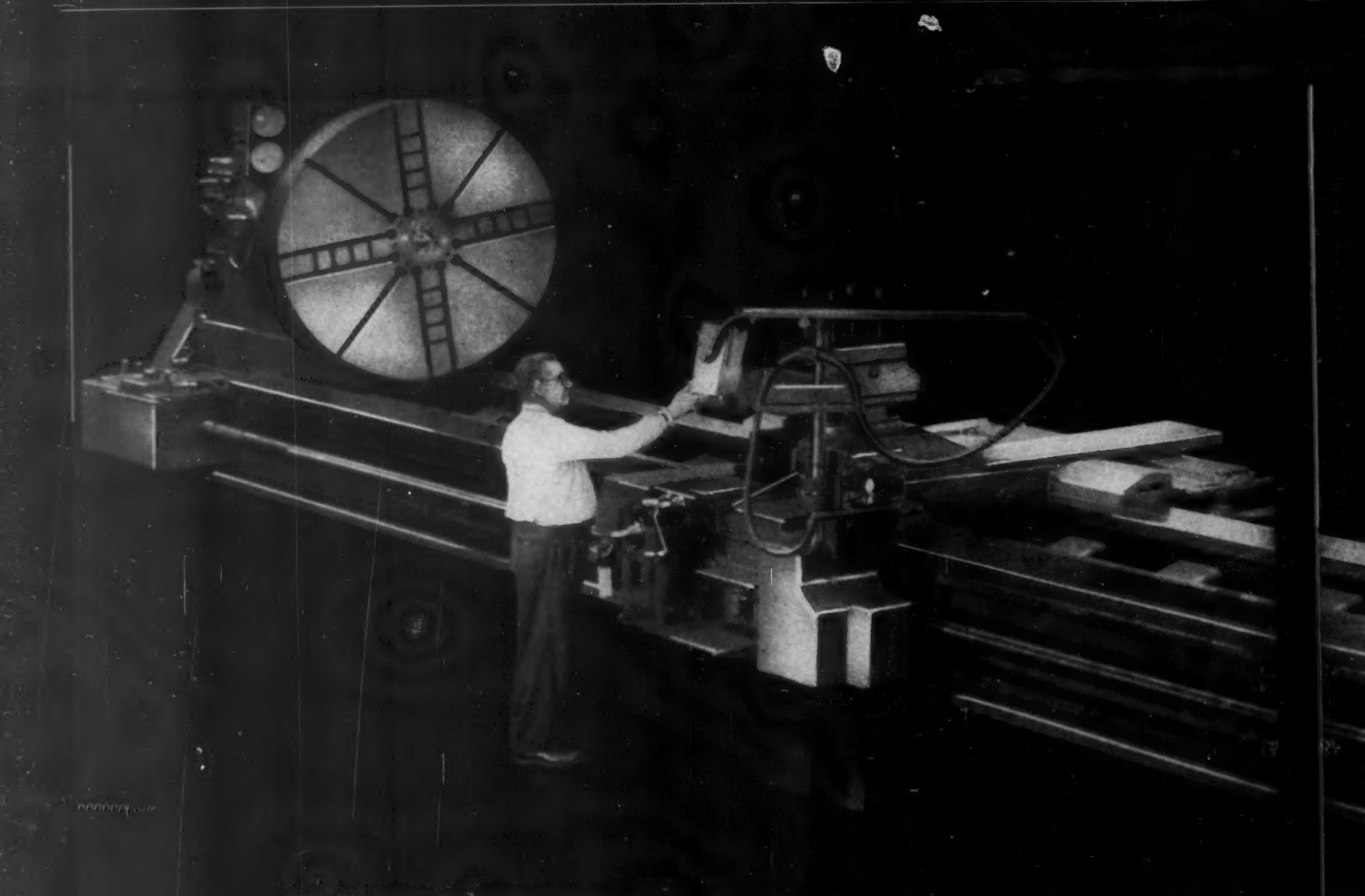
Name _____

Title _____

Company _____

Address _____

City _____ State _____



NILES 72" Heavy-Duty Engine Lathe: Swing over bed and carriage wings is 73½" . . . over carriage bridge, 56". Main drive accommodates 150 hp., adjustable-speed, 4:1 DC motor (with variable voltage drive optional). Speed ranges—1.35 to 101 rpm or 2.2 to 151 rpm (optional).

Metalworking News from HAMILTON!

New NILES 72" Engine Lathe for faster set-ups,

Here's welcome metalworking news from Hamilton! An all-new 72" heavy duty engine lathe to boost your turning speeds and accuracy . . . for top machining quality at lowest cost. It's the Niles A72 Lathe with these exclusive bonus features:

Speed and load indicators on faceplate drive . . . for constant operator check on machine performance. Permits capacity loading with no danger of applying excessive overloads.

Adjustable, springloaded tailstock quill with load indicator . . . for accurate quill spring preloading to suit work piece. Cuts setup time and prevents damage to centers.

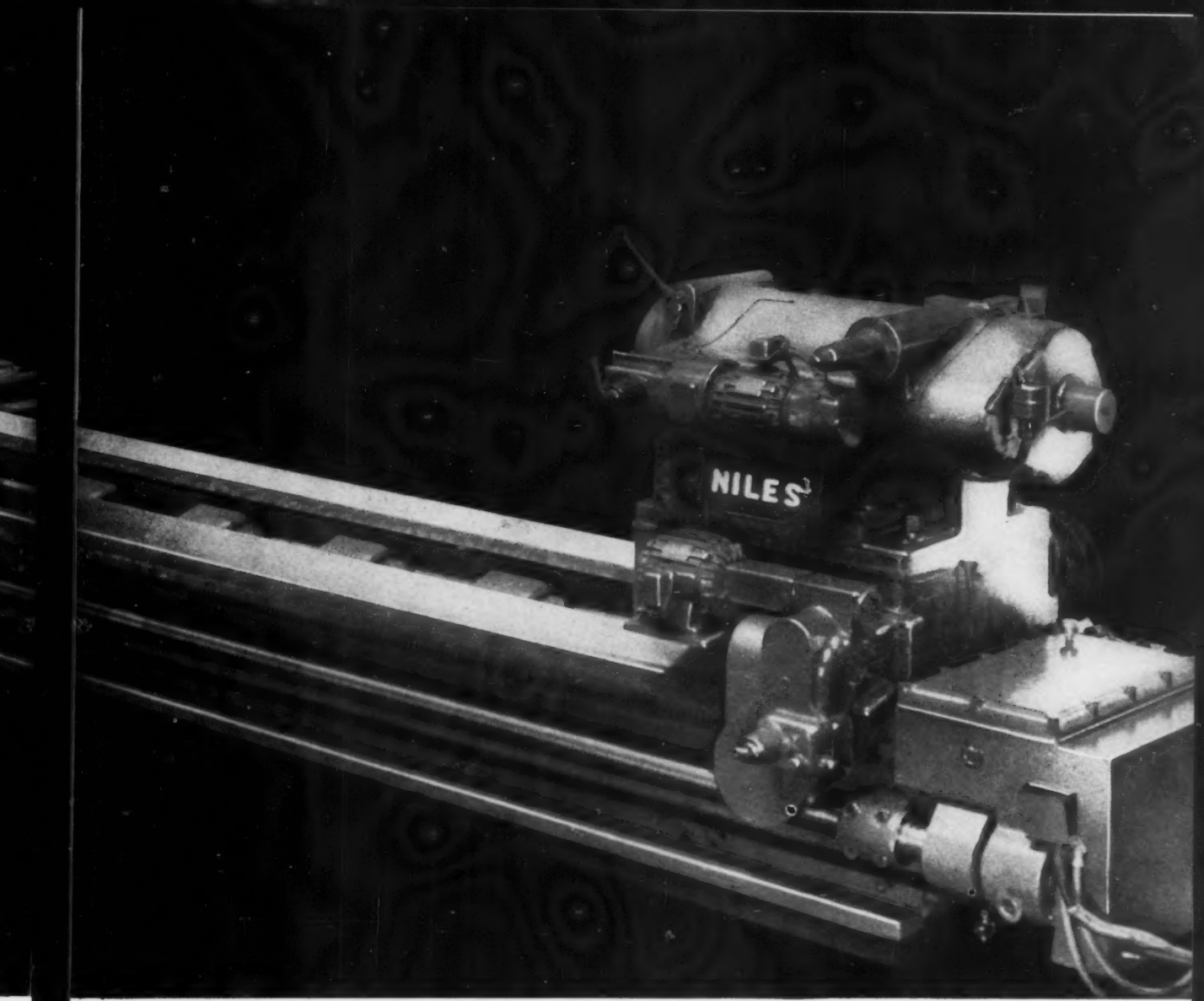
Fully enclosed leadscrew and thread selector dial . . . outmodes old-style tumbler gear selector. Eliminates opening where dust and dirt can enter to contaminate gear lubricant and foul machine operation. *Safer too!*

Hydraulic booster on faceplate speed changer . . . eliminates the heavy manual labor needed to change speeds on other large lathes.

Lubrication oil-pressure safeguard . . . prevents operating machine until positive lubrication is applied.

Optional electronic or mechanical feeds . . . with one lever selection and full pushbutton control at carriage station for either feed. Safety interlocks prevent simultaneous engagement of both. Number of feeds available: 64!

Put this new Niles A72 Lathe on *your* shop floor! You'll speed set-ups, cut machining time and slash operating costs on your heavy duty turning jobs. Easy, accurate controls make child's play of close tolerances. Get complete details on the all-new Niles A72 Lathe today. Send for new bulletin containing full specifications. Address: Dept. 9902, Hamilton Division, BLH Corporation, Hamilton, Ohio.



more accurate turning—at lowest operating cost

Look to HAMILTON for the engineering know-how, experience and facilities that mean outstanding performance *for you* from the full line of NILES Machine Tools:

NILES Heavy Engine Lathes—50″, 60″, 72″, 84″, 96″ and larger

NILES Vertical Boring and Turning Mills—12′, 14′, 16′, 30′ and 43′

NILES Railroad Tools—Hydraulic Centering Machine, End Drive Axle Lathe, Hydraulic Car Wheel Lathe, Hydraulic Diesel and Car Wheel Borers, Hydraulic Axle Burnishing Lathe

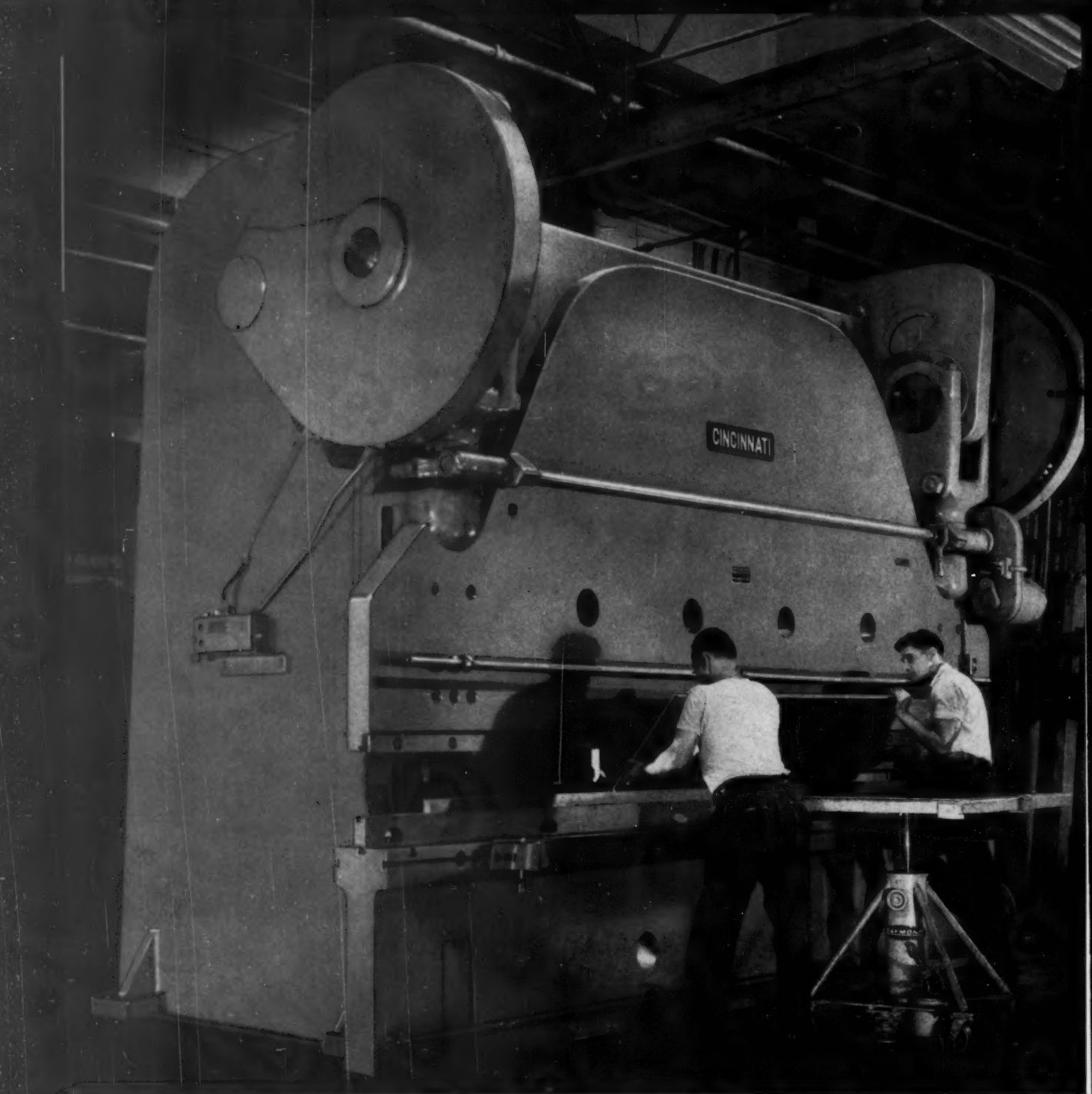
HAMILTON Mechanical Presses—single, double and triple action presses for metal forming and stamping; also open back inclinable presses, rail presses, welding presses and die fitting machines

BALDWIN · BLH · LIMA-HAMILTON

HAMILTON DIVISION

BALDWIN-LIMA-HAMILTON

DIVISIONS: Austin-Western • Eddystone • Hamilton • Electronics & Instrumentation • Lima • Madsen • Loewy-Hydropress • Pelton • Standard Steel Works



This 13 Series x 12′ Cincinnati Press Brake has a capacity of 250 tons and is used for many types of forming and punching work at the Falstrom Plant.

This 2512 Series Cincinnati Shear has a capacity of ⅜" x 12′ long mild steel plate, and is used to shear a variety of metals to micrometer accuracy.

● Photos courtesy Falstrom Company, Passaic, N. J.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

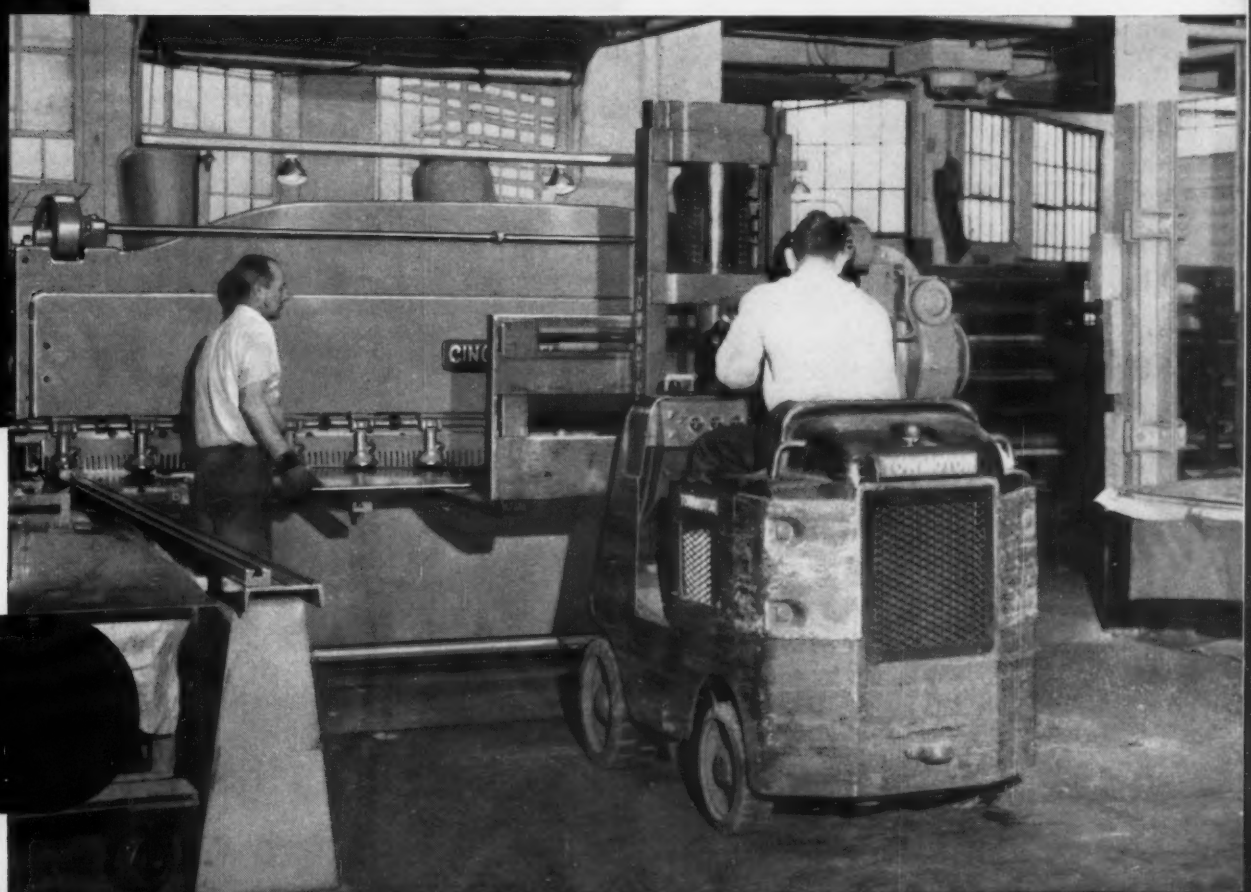
Cincinnati Shears and Press Brakes produce a wide variety of precision custom metal work

at FALSTROM COMPANY, Passaic, N. J.

Three Cincinnati Shears and five Cincinnati Press Brakes are profitable producers in this finely equipped plant. A broad variety of precision work in many different metals is done on these versatile machines, yet changes from job to job are made rapidly with minimum loss of time. Due to the accuracy of their Cincinnati Shears and Press Brakes, Falstrom Company has been able to minimize the use of welded construction in their special fabricated products.

•

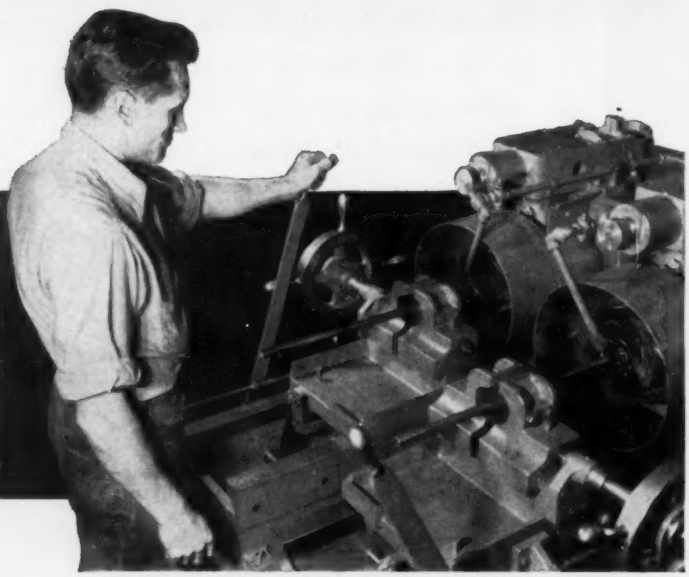
Consult our Application Engineering Department about ***your*** production problems, and write Department ***D*** for Catalog S-7R on Cincinnati Shears and Catalog B-4R on Cincinnati Press Brakes.

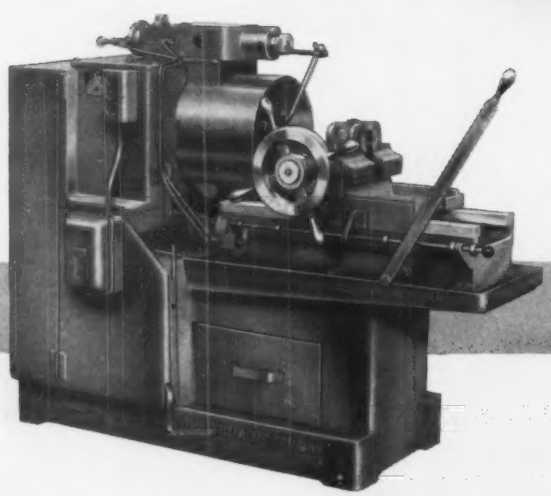


The Acme model XLA Threading Machine

A new addition to the HILL ACME line of heavy duty precision equipment – RUGGED, ACCURATE, LOW PRICED

The ACME Model XLA Threader is a low cost, heavy duty threading machine designed for either maintenance work or for production operations when equipped with automatic features. The ACME XLA is built in single and double spindle design in sizes of 1", 1½", 2" and 2½" capacity.





ACME Model XLA Threaders can be equipped with either the "HILLCO" Tangential Die Head, for production work, or with the "ACME" Hob Type head for maintenance operations. This precision machine with it's amazing versatility is priced to fit YOUR budget.

Bulletin XLA gives complete details.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

You get what you want with

DANLY

PRESSES

PLANT SUPERINTENDENTS

get production they can count on

Danly Presses work full time. You don't have to worry about breakdowns and there's less "waiting" time because dies last longer between grinds. Precise, accurate alignment of Danly Presses makes set-up faster, too. Manpower efficiency goes up because controls are designed for fast, safe operation.

Your Danly's stay in top shape, too. Maintenance crews can't "forget" to lubricate a Danly Press—automatic, built-in system circulates oil under pressure all the time the press is in action. You get the production you want with Danly Presses—when you want it.

DANLY MACHINE SPECIALTIES, INC.
2100 S. Laramie Ave., Chicago 50, Ill.

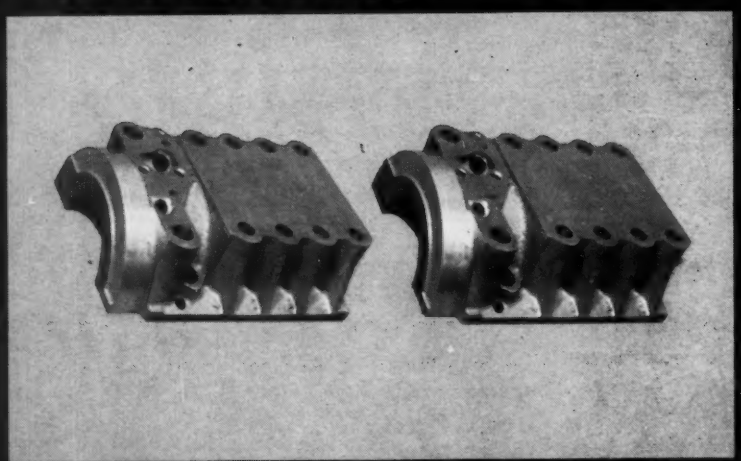
Ask for your copy of the Danly "Press Catalog." It gives the whole story on how Danly Presses are built for you. Write today.



DANLY®

THREE NEW DEVELOPMENTS
Increase Production

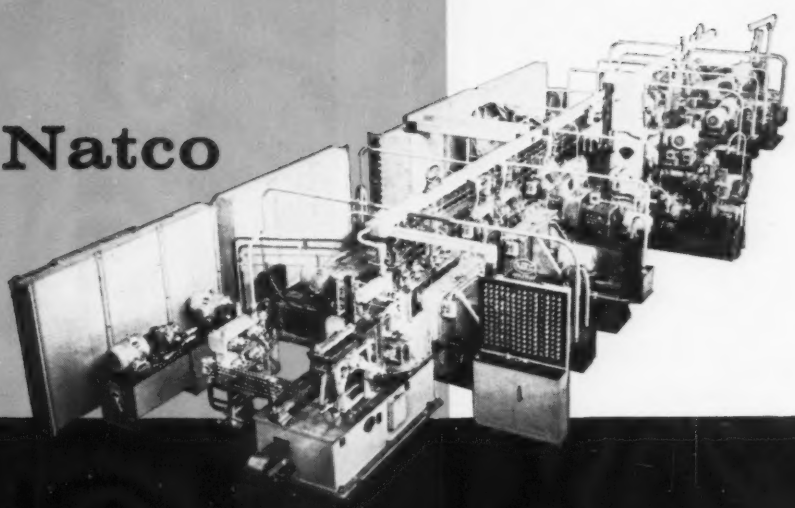
2-at-a-time processing



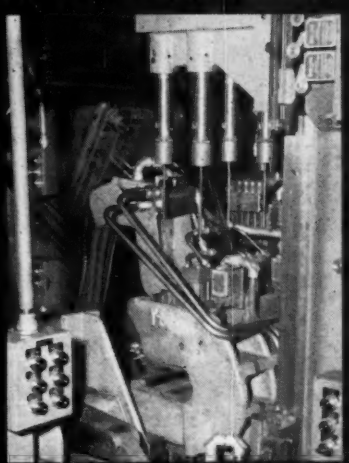
300 HP Natco greatly increases production by processing two complete sets of bearing caps at once.

Bearing caps—240 *sets* per hour—six times the production rate of the machine replaced! This new Natco processes two complete sets at once. It loads surface-broached castings automatically, performs 80 machining operations, places matched sets of finished bearing caps on the assembly conveyor. In addition to broaching and sawing, this 300 HP, 27-station Natco, drills, reams taps, turns, mills, probes and faces.

help this Natco 600%

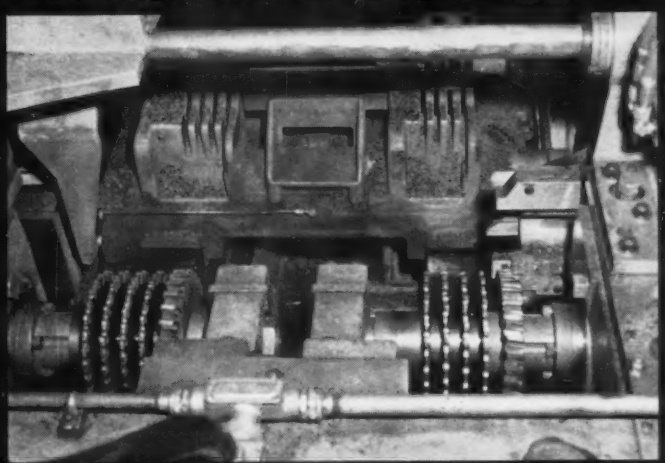


Unique Broaching Station



Fully automatic broaching station eliminates need for withdrawing broaching tools after cut. Broaching tools are pulled completely through hole, removing .030″ stock.

New Rigid Saw Station



80 HP sawing station cuts two castings into complete sets of 5 caps each. All surfaces parallel within .0015″. Fixture feeds castings into stationary mounted saws, providing rigidity for accurate 14 ipm cutting.

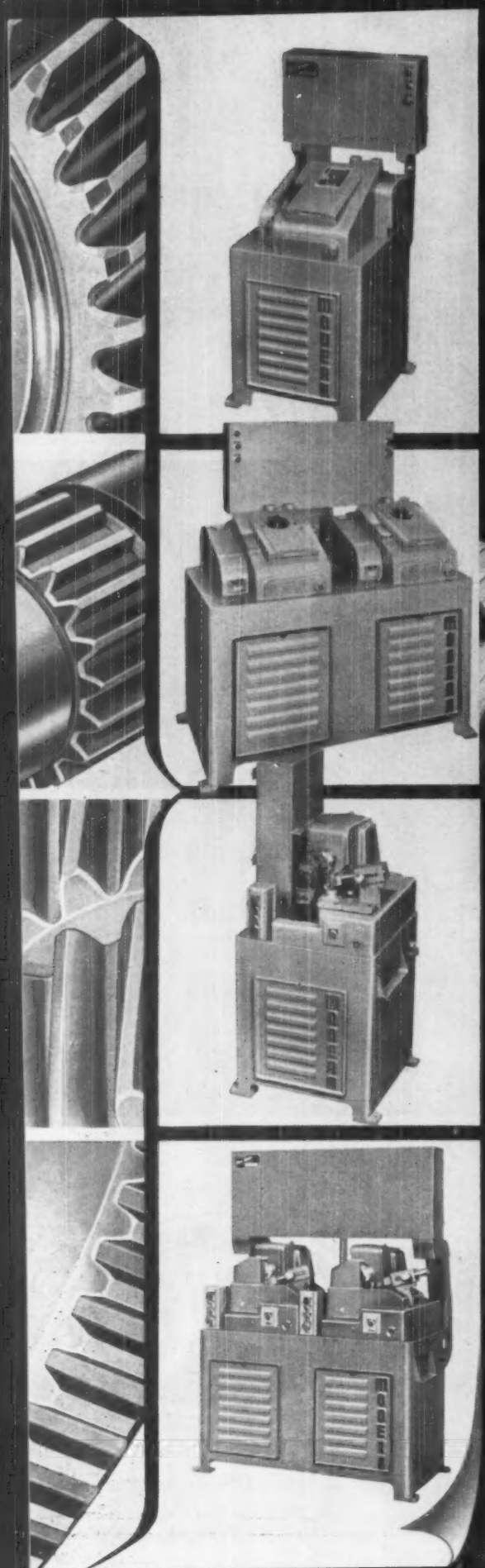
Whatever your high production problem, our engineers will work closely with your people to develop exactly the method and the machine to do your job best. Besides special way-type, index and transfer machines, Natco also builds multiple drilling, boring, facing and tapping machines. Call your nearest Natco office in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

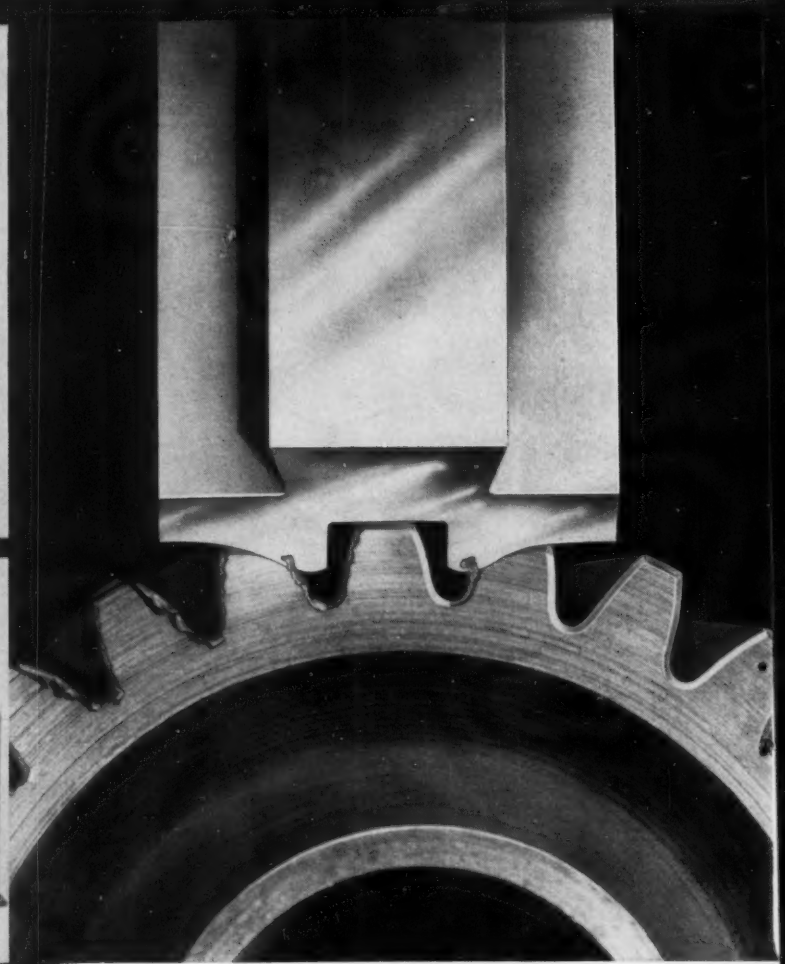
Partners in Production

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC. *Richmond, Ind.*

Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan





GET RID OF YOUR BURRS THE LOW COST MODERN WAY

You know how costly removing burrs can be. **MODERN** can cut those costs for you—drastically and positively. **MODERN** Burr-Masters remove the burrs from all kinds of toothed parts—internal and external gears, splines, sprockets, clutches, etc.—leaving a smooth GENERATED chamfer over the entire contour.

High productivity is a feature of all models, averaging five teeth per second.

They chamfer-deburr so positively and so accurately that your engineers can now include dimensional deburr-chamfers on part prints and process sheets. Where functional chamfers are desired, Burr-Masters produce these while deburring—eliminating extra operations.

Here are a few of our Burr-Masters, and the types of parts they deburr. Chances are we have just the Burr-Master to suit your needs. Our sales department can provide you with complete details. Ask for a copy of Bulletin BM-156.

14230 BIRWOOD AVE.. **MODERN**® DETROIT 38, MICHIGAN

Industrial Engineering Co.



New Assembling Methods & Machines

New fast functional chamfering of almost any kind of part



New Ways to Bond Metals to Non-metals

Complete Deburring & Chamfering



with

Burr-Masters

For all kinds of innovations in

New Machines to Cut Your Costs

in 1957 watch

14230 BIRWOOD AVE., **MODERN**® DETROIT 38, MICHIGAN

Industrial Engineering Co.

Positive deburring of any toothed part at 5 teeth/second



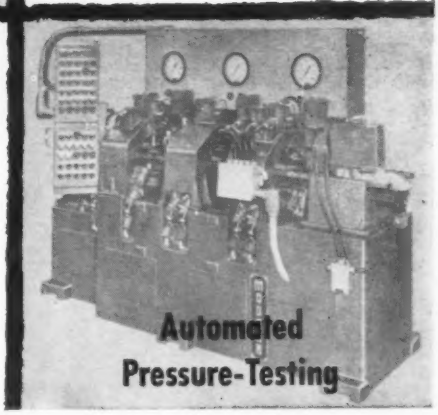
All Kinds of Multi-station Machines

Positive deburring of non-toothed parts



New Types of Burr-Blasters

New machines for non-machining operations on machined parts



Automated Pressure-Testing

DETROIT 38, MICHIGAN

Industrial Engineering Co.

You can acquire a new 4" Table Type machine for as little as $1.71 an hour, if you operate two 40-hour shifts, by using Gilbert's new financing plan: 6% simple interest (3% add on), up to 5 years to pay. (These prices are subject to change.) 3½" and 3¾" Table Type machines cost even less to own.



new 4" and 5"

Every modern feature that can reduce floor-to-floor time is built into these new Gilbert 4″ and 5″ boring mills.

For one example, your operator can preselect speeds and feeds, and power automatic shifting takes over from there. For another, the pushbutton station makes his job easier and reduces his machine-handling time. This controls start, stop, and reverse for spindle; spindle electric clutch and brake; reverse for all feeds; forward, reverse power rapid traverse; spindle and milling feeds and rapid traverse; back gear clutch on spindle sleeve; milling feeds to head, table, and saddle (table type), or head and column (floor type); spindle feed electric clutch; power clamp, head to column (table type) or to head and base-to-runway (floor type); and automatic positioning, if ordered.

The built-in reversible motor (up to 20 hp) on the head puts maximum power to the tool; there are no long drive shafts. Speeds up to 1,500 rpm are standard.

The Cincinnati Gilbert Machine Tool Co.
3346 Beekman Street, Cincinnati 23, Ohio

those who buy
GILBERT
buy Gilbert again



boring mills

LeBlond customers report:

New REGAL lathe design

Recommended by machine shop operators

it is the best lathe I have found in 35 yrs. experience

Best Tool Room lathe I have used in the past 14 years, also Best lathe for the money.

I liked the looks and the Rigidity.

P.S. I also have another one on order.

more for my money.



scores high with operators

"Satisfied" or "well pleased" report 95% of new Regal operators! Source of these figures is the LeBlond Use-Check Questionnaire, which we send to all new LeBlond lathe owners—a direct method of learning what industry wants, needs, likes (or dislikes) in its lathes. Actually, the new Regal Lathe is designed largely around suggestions and ideas expressed by our customers in Use-Check Questionnaires of recent years.

What do the owners say about the new Regal?

Best-liked Regal features proved to be hardened bedways, electric brake and the speed range. 73% of the new Regals are being used in the toolroom or on the production line. Here's how some of the other questions and answers ran:

Q. "*Is production rate what you expected?*"
A. "Satisfactory or better" (96%).
Q. "*accuracy?*"
A. "Satisfactory or better" (97%).
Q. "*finish?*"
A. "Satisfactory or better" (96%).
Q. "*convenience?*"
A. "Satisfactory or better" (93%).
Q. "*Why did you select a LeBlond?*"
A. "Best dollar value." "Previous experience" (two biggest reasons).

At left are some of our customers' comments in their own handwriting.

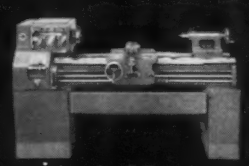
The reason for this overwhelming acceptance of the new LeBlond Regal can be summed up very simply. It is what industry has been asking for—performance-wise, feature-wise, price-wise. Your LeBlond Distributor will give you all the details. Call him today, or write.

. . . cut with confidence

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

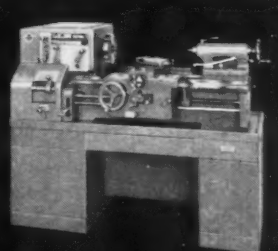
Designed and built like heavy-duty lathes, the new LeBlond Regals will give you a long life of precision production, minimum maintenance and the kind of dependability you'd expect from a much higher-priced machine!


13" and 15" Regals

The new Regal headstock uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16" heavy-duty lathe. The new bed has hardened and ground replaceable steel ways like the ways on our heavy-duty machines. They are fitted according to the compensating veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.


15" and 19" Regals

Again, like higher-priced lathes, Regals are equipped with both feed rod and leadscrew for continued accuracy in thread chasing. Other big-lathe features — 3-bearing spindle. Automatically-lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. Plus general dimensions and construction details patterned after LeBlond heavy-duty lathes.

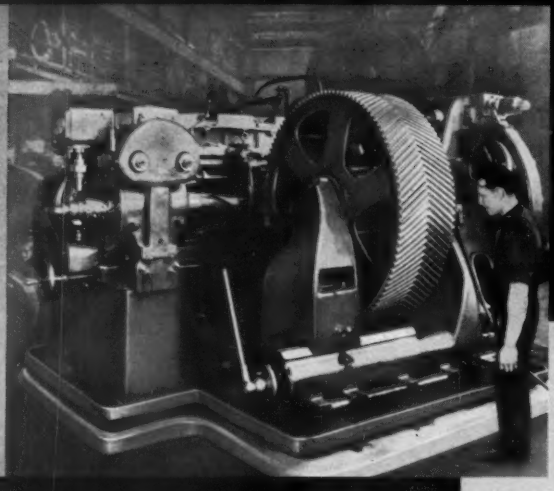

13" Regal Bench Model

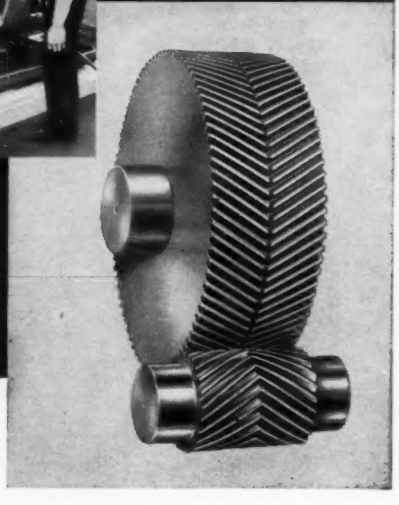
All of LeBlond's 70 years of experience has gone into the design and building of these new Regals. Only from the builder of a complete line of lathes can you get a low-priced lathe with big-lathe features.

World's Largest Builder of A Complete Line of Lathes for More Than 70 Years

HERRINGBONE GEARS







c-o-n-t-i-n-u-o-u-s TOOTH TYPE

for HEAVY SHOCK LOADS AT HIGH *SPEEDS*

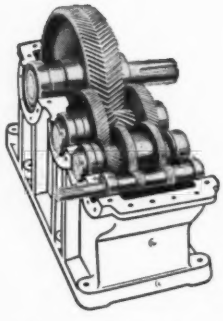
Philadelphia gears for every purpose

- Spur
- Spur Internal
- Helical
- Helical Internal
- Herringbone
- Worm
- Spiral-Bevel
- Hypoid
- Zerol
- Coniflex Bevel
- Racks
- Splines
- Sprockets

Continuous tooth herringbone gears—cut without separation between the opposing helical tooth surfaces—have no equal in gear capacity. They afford greater active face width, greater speed capacity, quieter operation than conventional double helical gears of equal size.

Philadelphia Herringbone gears are indicated for heavy load service, or where tough, continuous operation, shock and/or vibration are factors. Often referred to as "gears with a backbone", Philadelphia Herringbones offer extremely smooth power transmission in sizes up to 2 D.P.; 60" diameter, 18" face width. They create no end thrust, since the opposing helices counterbalance each other.

When specifying gear drives or speed reducers—insist upon Philadelphia, the most honored name in gearing for more than 60 years.



Triple reduction Philadelphia Herringbone Speed Reducer

phillie gear®

PHILADELPHIA GEAR WORKS, INC.

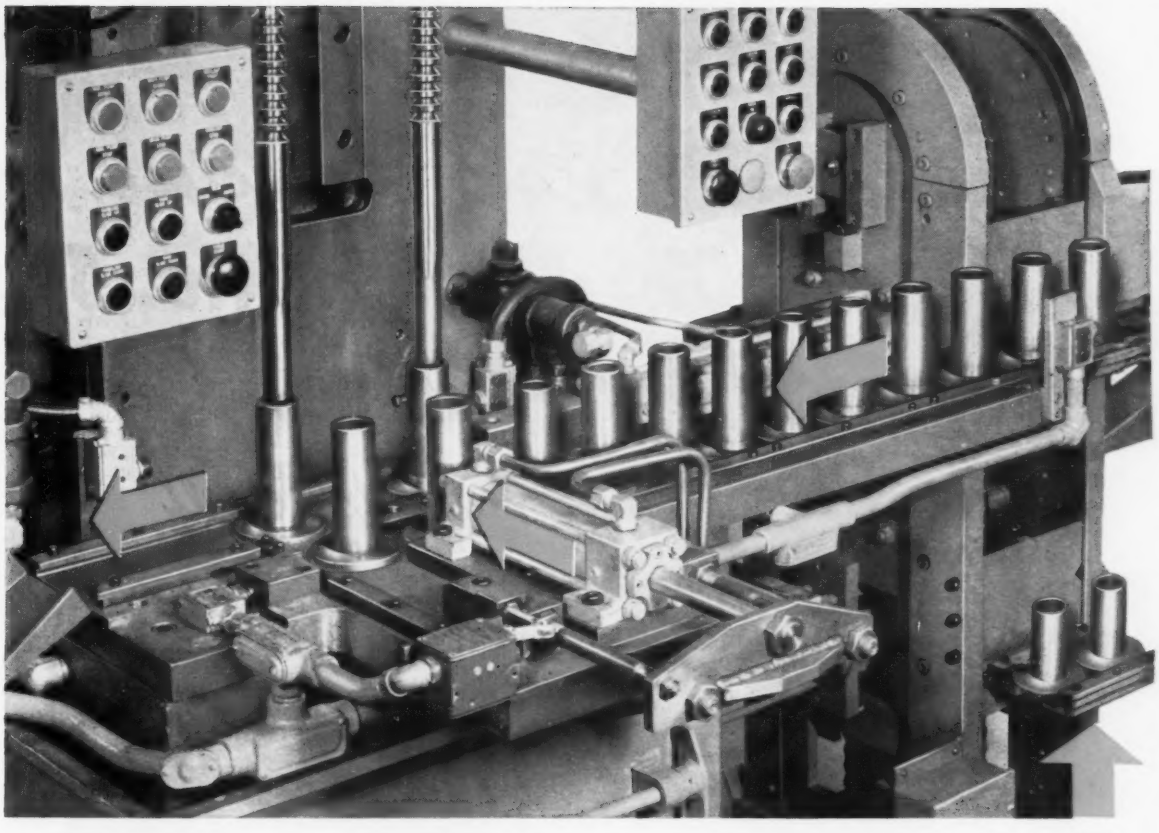
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Virginia Gear & Machine Corp. • Lynchburg, Va.

Cincinnati 8, Ohio



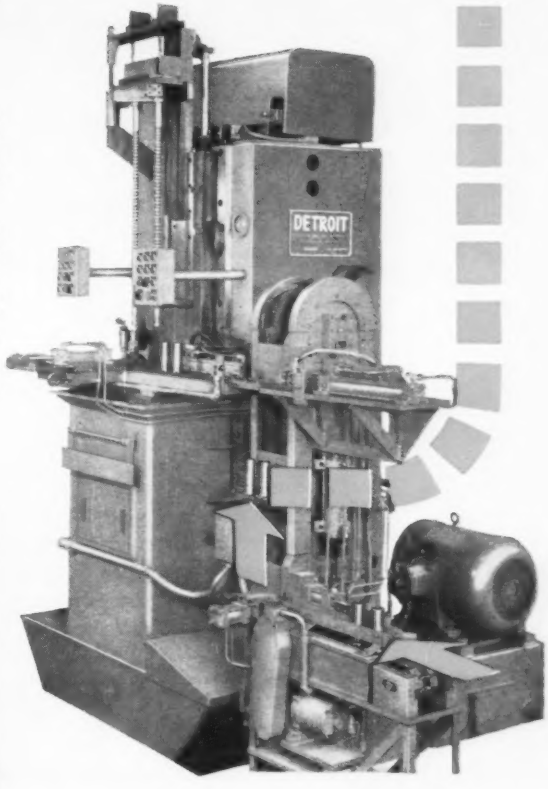
STANDARD Broaching Machine Tooled for AUTOMATION

This broaching setup on a Detroit 15-ton, 42-inch Vertical Pull Down Machine illustrates *practical* automation! It combines the economy of a standard machine, readily retooled for production changes, with a special work handling system that makes floor-to-floor operation fully automatic.

Flanged work pieces are loaded at floor level, conveyed to an elevator, raised, pushed off and shuttled into broaching position, broached and unloaded . . . all without an operator. Each broaching stroke sizes the I.D. and removes excess welding at the flange joint. Parts are handled as fast as they can be supplied by the "automatics" ahead of this operation.

The same broaching specialists who created this productive combination of "standard and special" can help solve *your* production problem. Send parts, prints or details now.

Write for bulletin describing Detroit Vertical Pull Down Machines.



DETROIT BROACH & MACHINE COMPANY

DEPT. B-2 • ROCHESTER, MICHIGAN

For more information fill in page number on Inquiry Card, on page 239

JOHN BATH & COMPANY



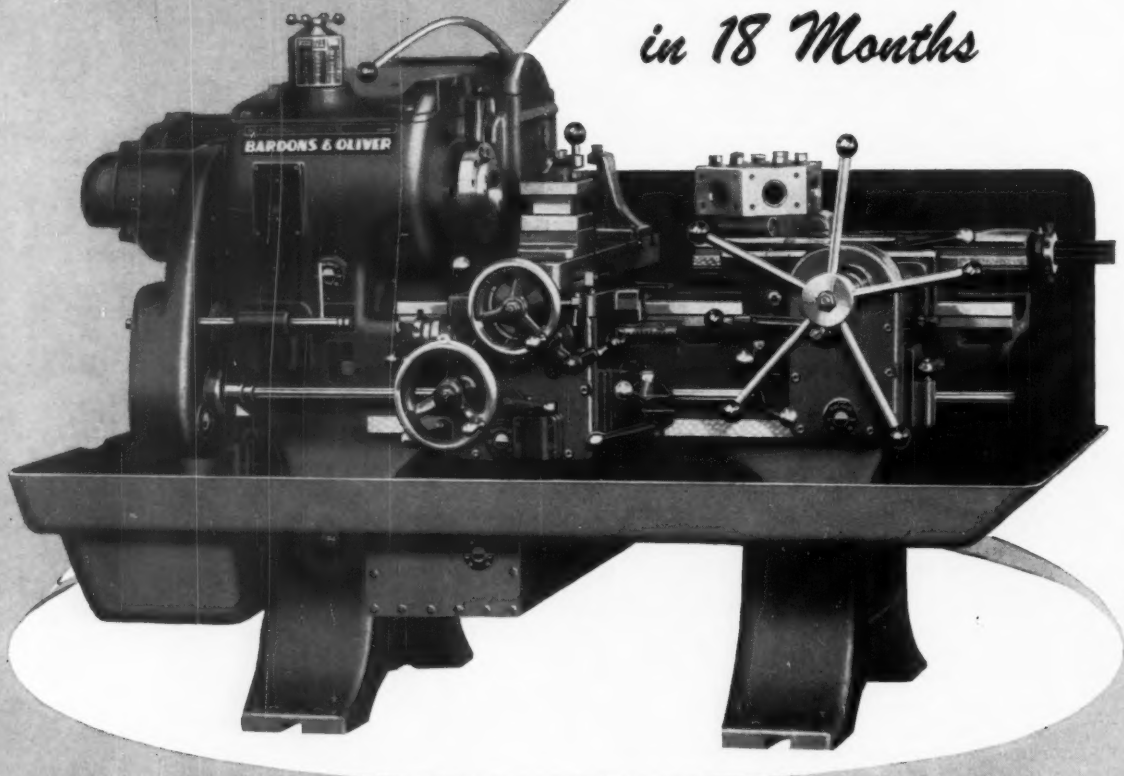
Reports a **35%** *Cost Reduction...*

on the **BARDONS & OLIVER No. 5**

Universal Turret Lathe...

and the Machine has Paid for itself

in 18 Months



Six sizes of Ram Type and two sizes of Saddle Type Turret Lathes comprise the complete line of Bardons & Oliver machines. The many production and labor saving features make each model an outstanding producer in its range of work. We welcome the opportunity to make similar savings for you. Send blueprints or specifications of your requirements.

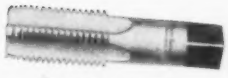
BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO











GROUND THREAD TAPS
PLUG THREAD GAGES
RING THREAD GAGES

Ground from the Solid

JOHN BATH & COMPANY

INCORPORATED

18 GRAFTON STREET

WORCESTER, MASSACHUSETTS

TELEPHONE 6-5721

SUPER INTERNAL MICROMETERS
MASTER REFERENCE RINGS
COMMERCIAL THREAD GRINDING

December 3, 1956

Bardons & Oliver, Inc.
1133 West 9th Street
Cleveland 13, Ohio

Gentlemen:

The No. 5 Bardons & Oliver Universal Turret Lathe received from you in April 1955 has now been in continuous operation for eighteen months.

It is used primarily to manufacture certain sizes of tap blanks in one operation which formerly required several machines.

The cost of performing these operations has been reduced by about thirty-five per cent since using the Bardons & Oliver Turret Lathe. We estimate that the machine has just about paid for itself already.

Performance of the machine has been very satisfactory with a minimum of down time.

Yours very truly,

JOHN BATH & COMPANY, INC.

Harold L Peterson

HLP:MP

Harold L. Peterson
General Superintendent

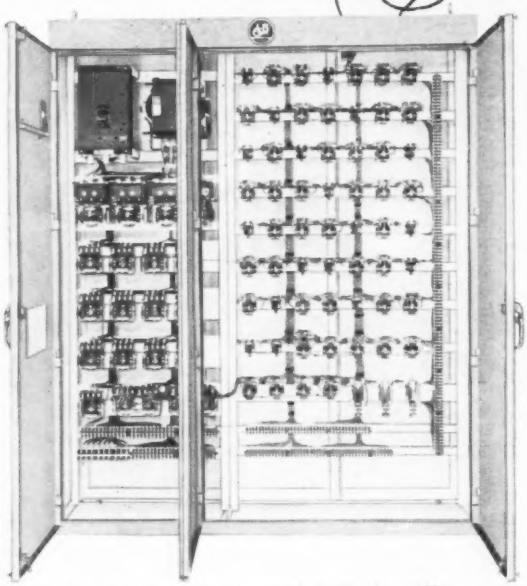
MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING-OFF LATHES

FACTORY EQUIPPED with ALLEN-BRADLEY *Motor Control*



This Kearney & Trecker Six Station Automatic Transfer Machine completes engine blocks in one continuous operation.

KEARNEY & TRECKER automatic transfer machine



Special motor control panel built by Allen-Bradley for Kearney & Trecker Automatic Transfer Machine. All panel units are standard —listed in the Allen-Bradley Handy Catalog.

Naturally, Kearney & Trecker insists on motor control that is both reliable and maintenance free. That's why their special control panels are built by Allen-Bradley from standard Allen-Bradley control units.

The reliability and maintenance free operation of Allen-Bradley control is an established fact, proven in many years of service. Its remarkable simplicity is your guarantee of millions of trouble free operations. The familiar A-B trademark—recognized universally as the sign of QUALITY—is a decided sales asset for your equipment.

Write for your copy of the Allen-Bradley Handy Catalog. It is a condensed encyclopedia of the control used with modern machines.

Allen-Bradley Co.
1331 S. First St., Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ontario

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY



- 9" column; 3' or 4' arm
- spindle speed ratio of 40-to-1
- 12 speeds (up to 3200 rpm) through direct-reading dial
- automatic tapping reverse
- adjustable spring counterbalance (feel remains the same from lightest to heaviest tools)
- hardened tang slot
- safety elevating nut and screw (arm can't drop or overrun)
- hardened arm ways for head
- rigid accurate spindle mounted on 5 precision ball bearings

those who buy
GILBERT
buy Gilbert again

newest *high-speed* radial

Your many demands for a high-speed light-duty radial are met—completely and economically—by this new Gilbert 3 hp machine. Compare the features at the right with other radials of equal capacity, and you see why the Gilbert is the best buy in its class. Traditional Gilbert accuracy, fast response, and wide-angle work visibility make your shop more productive, more versatile. Variety of bases, runway mounting, or tables available. Get all the details in Bulletin 255.

The Cincinnati Gilbert Machine Tool Co.
3346 Beekman Street, Cincinnati 23, Ohio



Why designers specify FLEXLOC self-locking nuts

Where products must be tough . . . must stand up under vibration, shock and abuse . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts as fasteners.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting spring tension in the flexible locking collars. And they are reusable: rough screw threads, repeated removal and replacement, frequent adjustments will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes and materials, to meet the most critical locknut requirements. Your authorized industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

FLEXLOC® LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

Tear this chart out and preserve it

YOUR GUIDE TO COLUMBIA DIE AND SHOCK STEEL GRADES

TYPE AND GRADES	DESCRIPTION	HARDENING RANGE	QUENCH	TEMPERING RANGE	USEFUL HARDNESS
D3 — SUPERDIE	High carbon, high chromium, high production, oil hardening type with maximum resistance to abrasion for highest production	1700° F. to 1750° F.	Oil or Salt Bath	400° F. to 1000° F.	65/55 Rc
D2 — ATMODIE **D2S — ATMODIE SMOOTHCUT**	Air hardening, high carbon, high chromium, non-deforming heavy duty long run die steel with better toughness — also available with smoothcutting additives	1800° F. to 1850° F.	Air	400° F. to 600° F.	62/58 Rc
A2S — E-Z-DIE SMOOTHCUT	Air hardening 5% chromium, deep hardening die steel with smoothcutting additives for maximum economy	1750° F. to 1825° F.	Air	400° F. to 600° F.	62/58 Rc
01 — EXL-DIE	Standard manganese chromium tungsten non-deforming oil hardening die steel for guages, plastic molds, jigs and fixtures	1450° F. to 1500° F.	Oil	350° F. to 450° F.	64/60 Rc
S1 — BUSTER ALLOY	Tungsten chromium oil hardening shock resisting steel for heavy duty dies and punches for cold and hot work available in .50% carbon for maximum shock resistance, .60% carbon for best cutting edge life	1650° F. to 1750° F.	Oil	400° F. to 800° F.	61/52 Rc
S5 — CEC SMOOTHCUT	Silicon manganese alloy steel plus smoothcutting additives for heavy punching, shearing and shock applications, also tool shanks	1550° F. to 1600° F. 1600° F. to 1650° F.	Water Oil	400° F. to 600° F. 400° F. to 600° F.	62/57 Rc 62/57 Rc

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES:

1957

Chicago 32, 4832 S. Kedzie Ave., Phone LAfayette 3-3632
Cincinnati 25, 2716 Spring Grove Ave., Phone MUlberry 1-8400
Cleveland 14, 1640 St. Clair Ave., Phone MAin 1-1785
Detroit 3, 121 Oakman Blvd., Phone TUlsa 3-3770
Los Angeles 22, 6955 E. Bandini Blvd., Phone RAymond 3-4684
Milwaukee 4, 426 S. Sixth St., Phone BRoadway 6-0255
St. Louis 13, 5118 Easton Ave., Phone FOrest 1-0641

REPRESENTATIVES IN THE FOLLOWING CITIES: Dayton, Erie, Grand Rapids, Hartford, Indianapolis, Louisville, Moline, Newark, Portland and St. Paul

TOOL COLUMBIA STEELS

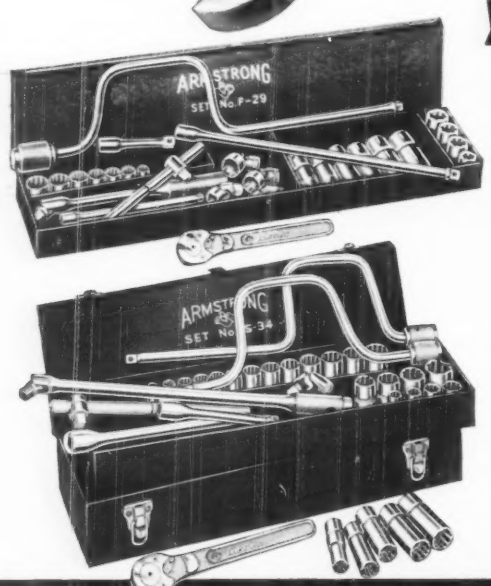
COLUMBIA TOOL STEELS

HIGH SPEED STEELS: Clarite — Vanite — Acmite — Cobite — Maxite — Molite Smoothcut Molite #3 HOT WORK STEELS: Clarite HW — Formite #3 — Formite #2 — Molite HW10 — Vanadium Firedie — Alcodie — Firedie CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra — Columbia Extra Headerdie — Vanadium Standard — Columbia Standard

ARMSTRONG WRENCHES



Choose Your Wrenches as you do your friends--for life



Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

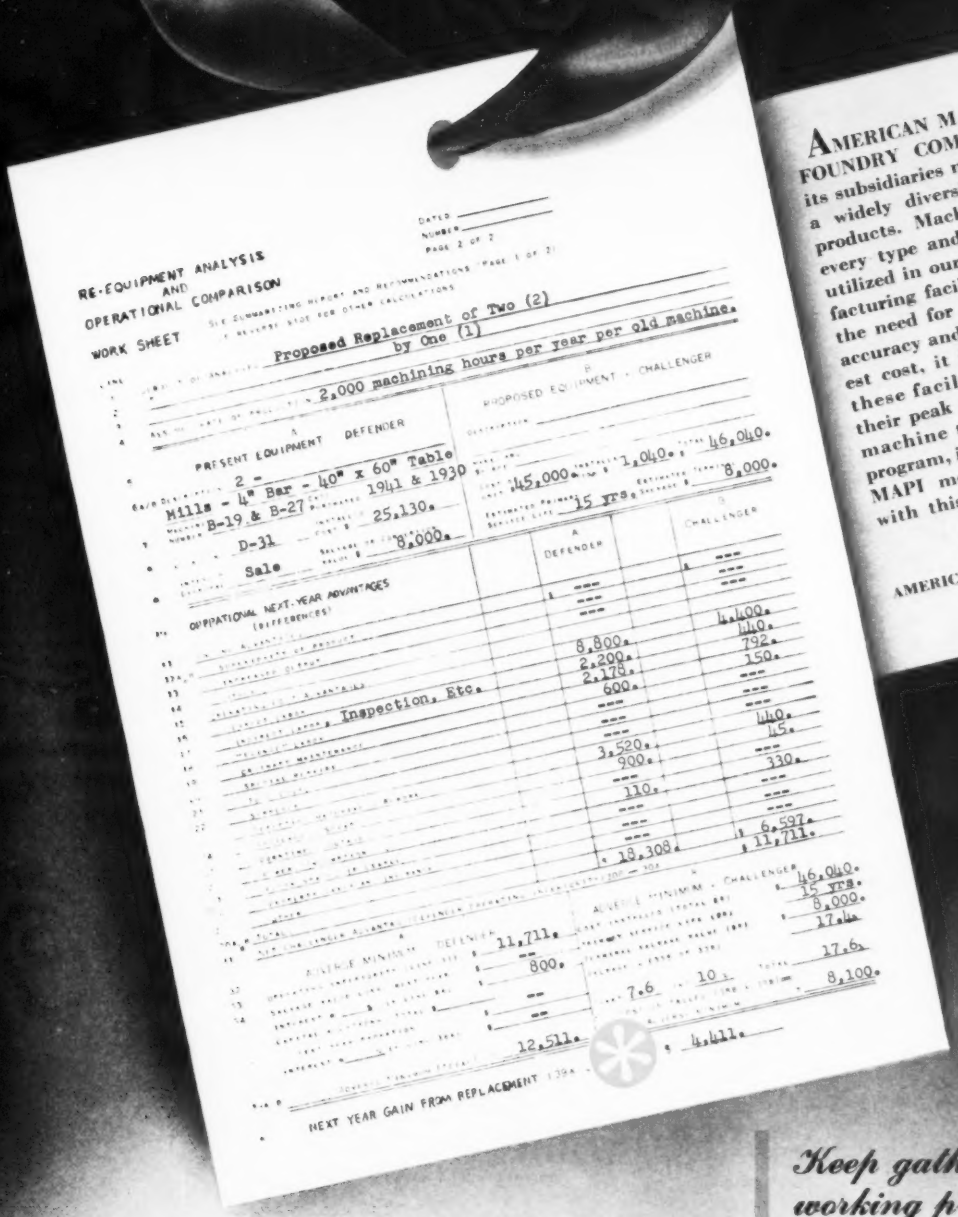
Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"*
5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

For more information fill in page number on Inquiry Card, on page 239

How American Machine and Foundry Company reduces its cost saving opportunities to careful analysis


RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

WORK SHEET

Proposed Replacement of Two (2) by One (1)

2,000 machining hours per year per old machine.

PRESENT EQUIPMENT — DEFENDER

2 — Mills - 4" Bar - 40" x 60" Table

B-19 & B-27 — 1941 & 1930 — 25,130.

D-31 — 8,000.

Sale

PROPOSED EQUIPMENT — CHALLENGER

45,000. — 1,040. — 46,040.

15 yrs. — 8,000.

OPPORTUNITY NEXT-YEAR ADVANTAGES (DIFFERENCES)

	A DEFENDER	CHALLENGER
	---	---
	---	---
	8,800.	4,400.
	2,200.	440.
	2,178.	792.
Inspection, Etc.	600.	150.
	---	---
	---	---
	---	440.
	3,520.	15.
	900.	---
	---	330.
	110.	---
	---	---
	---	---
	18,308.	6,597.
		11,711.

ANNUAL MINUSES — DEFENDER: 11,711. — 800. — 12,511.

ANNUAL MINUSES — CHALLENGER: 46,040. — 15 yrs. — 8,000. — 17.4% — 17.6 — 8,100. — 4,411.

NEXT YEAR GAIN FROM REPLACEMENT

AMERICAN MACHINE & FOUNDRY COMPANY and its subsidiaries manufacture a widely diversified line of products. Machine tools of every type and capacity are utilized in our many manufacturing facilities. To meet the need for ever increasing accuracy and quality at lowest cost, it is essential that these facilities be kept at their peak of efficiency. Our machine tool replacement program, in keeping with the MAPI method, is designed with this in mind.

Mr. Morehead Patterson
Chairman of the Board
AMERICAN MACHINE & FOUNDRY COMPANY

* **GAIN** from replacement under the Mapi Method is . . . after the return on the new investment . . . after allowance for future obsolescence of new equipment

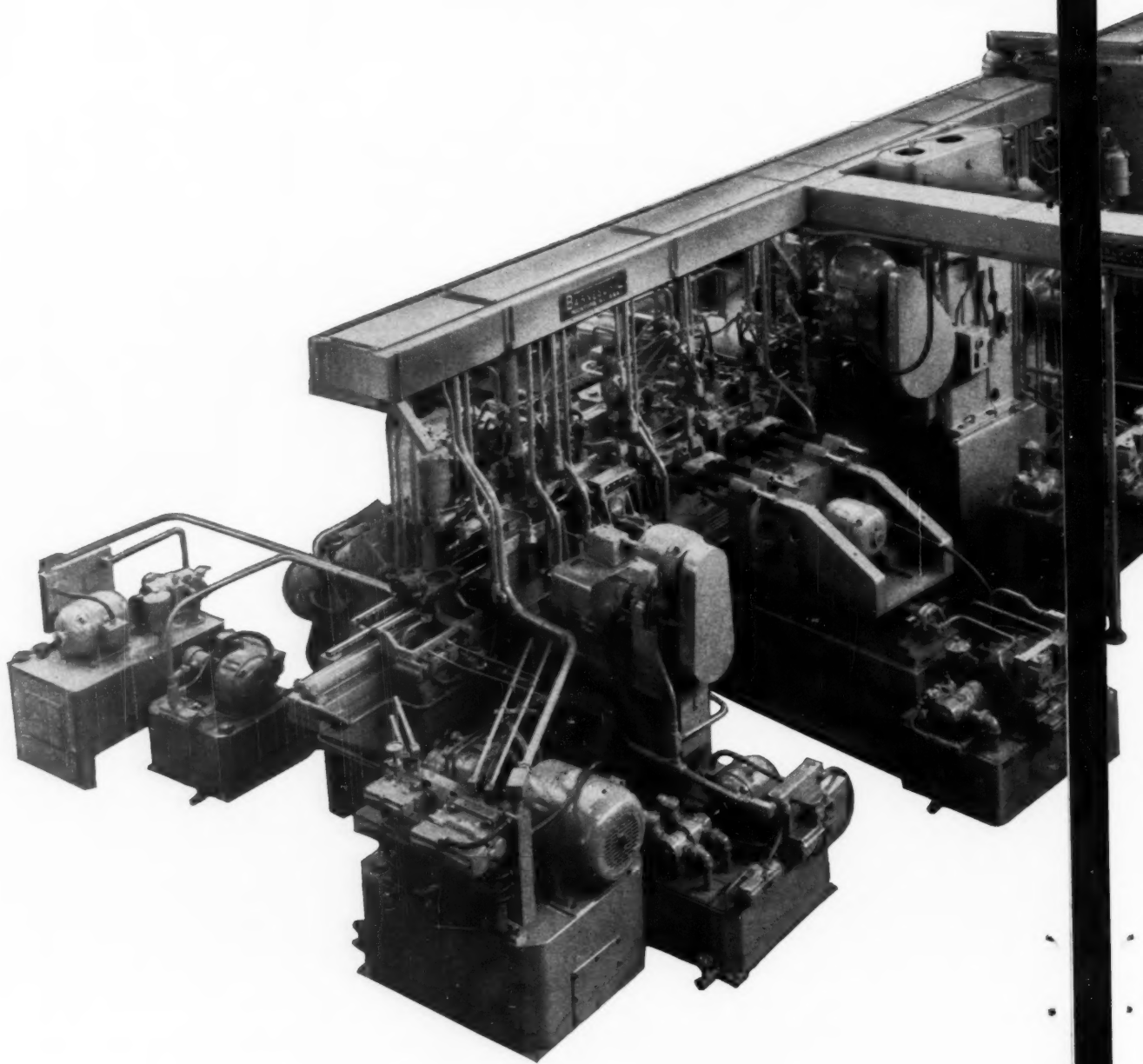
Keep gathering metal-working production ideas . . . be well informed when the time for replacement arrives.

Rockford Insert Group

February, 1957

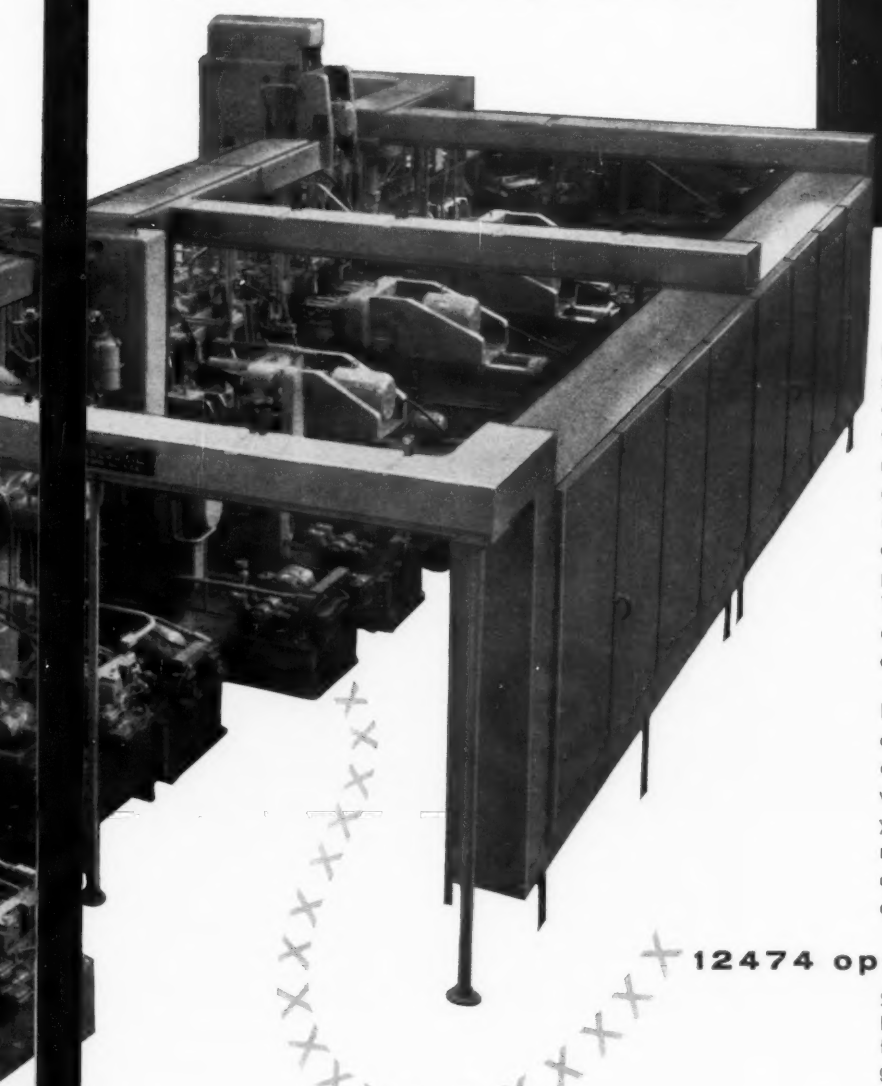
for automatic transfer-type production . . .

BARNESDRIL unit-machining multiplies



CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

production efficiency



For multiple-operation machining of transmission housings, automobile blocks, compressor cases, appliance components, implement or tractor parts — BarnesdriL engineers combine machining operations-within-operations at each transfer station to produce the maximum in machining efficiency. Each unit-machining cycle is built around the most efficient approach to the particular production problem. That's why some BarnesdriL automation machines may have as many as 26 stations, while others as few as 6 or 7.

If you have automatic transfer-type production, contact a BarnesdriL automation engineer for counsel. He will make recommendations which will be helpful to your production, yet place you under no obligation. If you desire estimates on production with automated machining, he will furnish recommendations and quotation.

12474 operations per hour

Special 26-Station Automatic Transfer-Type Production Machine which drills, reams, bores, faces, taps, counter-bores, mills, chamfers, gages, presses in pins, and automatically assembles cast iron timing chain covers at the rate of 126 covers per hour, 80% efficiency. There are a total of 99 operations on each piece.

50th year

BARNES DRILL CO.

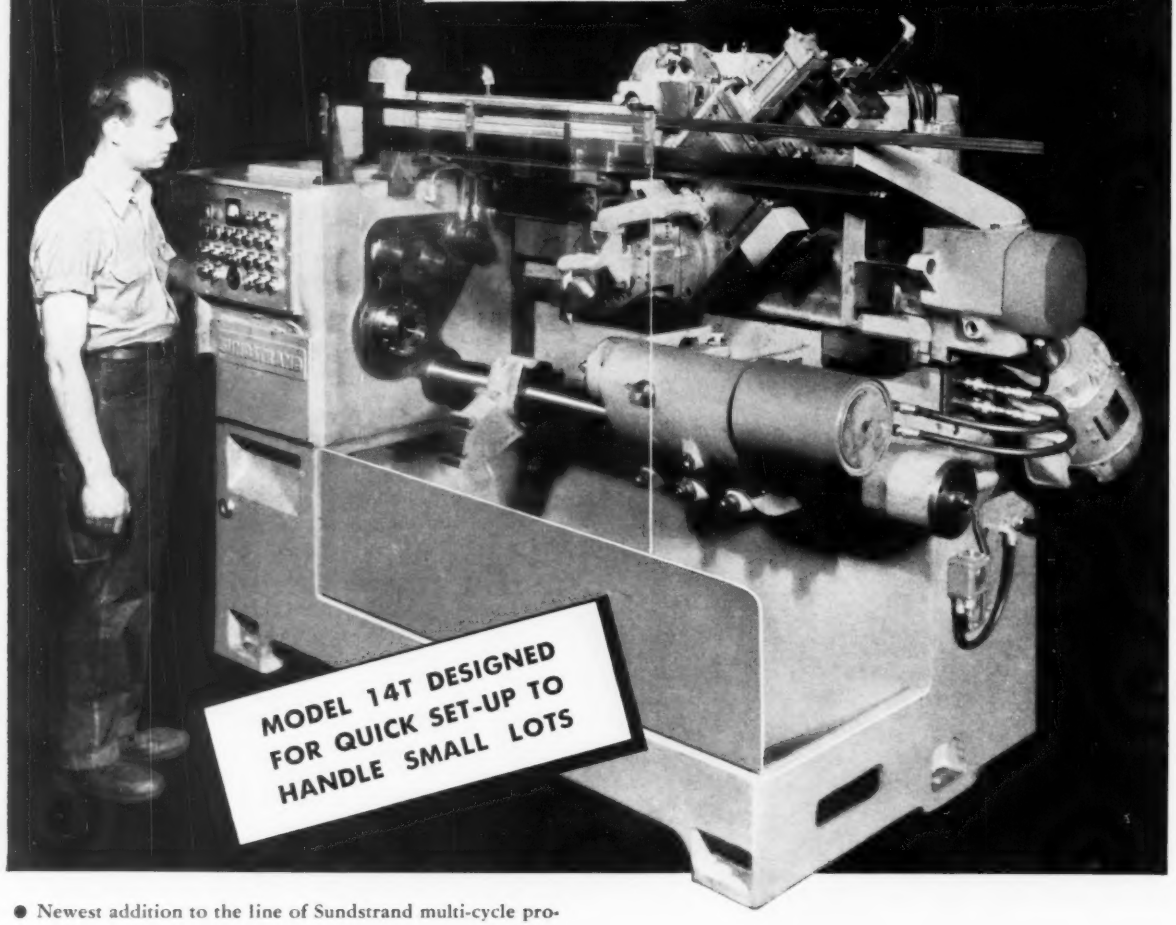
870 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

NEW! SUNDSTRAND

Multi-cycle *Hydraulic* Tracer Lathe!



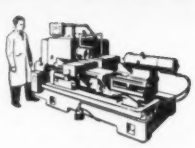
● Newest addition to the line of Sundstrand multi-cycle production lathes is the Model 14T with tracer control. Now, these 40-horsepower production lathes are available with three types of controls: hydraulic tracer, mechanical, and punch card — giving you the one best machine for your turning jobs. Hydraulic tracer control on the Model 14T makes machining of irregular shapes both fast and profitable. Only one template, readily accessible on the front of the machine, is required for multi-cycle cuts. For example, ruffing, semi-finish, and finish cuts all may be part of one automatic cycle. Shoulder facing tools can be provided where required, for squaring and similar operations.

AVAILABLE WITH 2, 4, OR 8-SPEED HEADS

Maintaining correct speeds and maximum horsepower on the Sundstrand multi-cycle lathes is assured by transmission-type heads that provide automatic speed changes. These heads are available in 2-speed, 4-speed, or 8-speed types, enabling a machine to be selected with spindle speeds ranging from 245 to 3025 rpm as best suited to production requirements of your plant.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







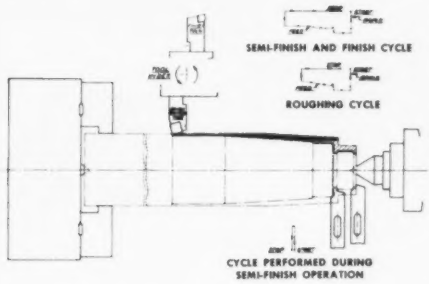
CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

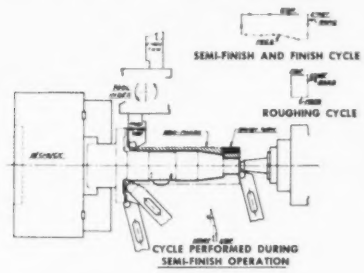
TURRET FOR RUFF AND FINISH TOOLS

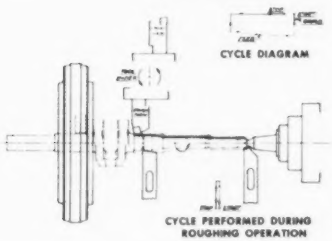
Indexing turret for turning tools provides ruff and semi-finish cuts with a ruffing tool and a finish cut with a finishing tool all in one automatic cycle.

TYPICAL TOOLING SETUPS

Jobs shown here are typical of those handled on Sundstrand Model 14 multi-cycle lathes.





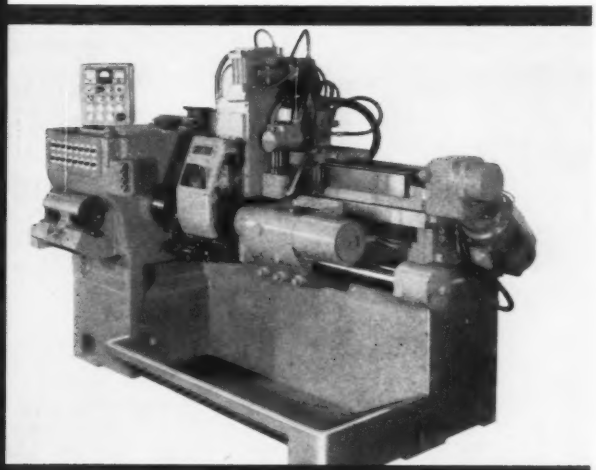


OTHER AVAILABLE TYPES



PUNCH CARD CONTROL . . .

With this system, decimal dimensions on engineering drawings are punched in standard business machine cards with a standard key punch. The cards are then fed into a reader, as shown above, which feeds the electrical signals into a machine control unit. This unit then controls all functions of the machine.



ADDITIONAL FEATURES

Here are a few additional features of Sundstrand multi-cycle lathes:

INFINITELY VARIABLE FEEDS from 7½ to 29½ inches per minute.

LARGE CHIP CAPACITY in large open cavity below facing tool carrier. Vertical ways are free from falling chips.

EASY FRONT LOADING with center line of spindle only 9 inches from front of machine.

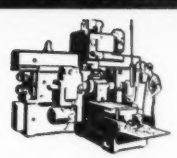
LENGTH BETWEEN CENTERS of 30, 40, 50 or 60 inches.

More information about Sundstrand multi-cycle lathes is available in Bulletin 676. Write for it today.

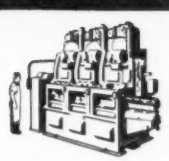
MECHANICAL CONTROL . . .

On the Model 14 mechanically operated machine the turning slide and shoulder facing tools are actuated independently. No template is required for step turning, and micrometer adjustment for steps is easy to set for size corrections due to material changes, etc. There is no lost motion for re-set because index takes place during cut.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



SUNDSTRAND
Machine Tool Co.

2530 Eleventh St. • Rockford, Ill., U.S.A.

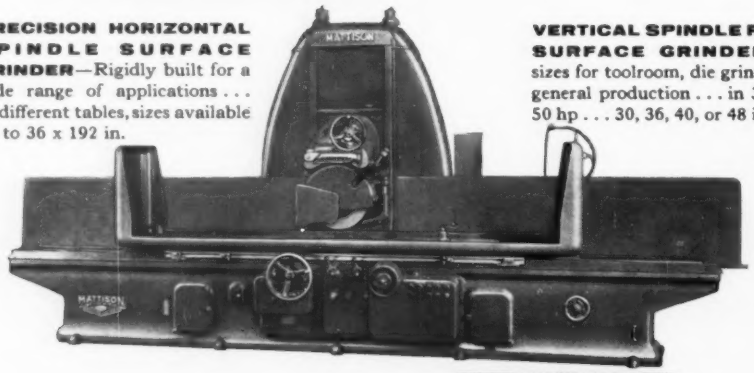
CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

MATTISON HIGH-POWERED PRECISION GRINDING METHODS

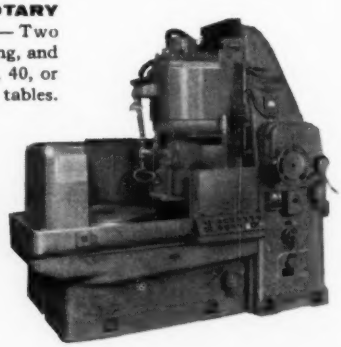
You'll find the extra power...

You'll find a profit-producing Mattison Grinder for every flat-surface machining application in your plant. Mattison Grinders can help step up production and upgrade quality on many jobs you may now be milling, broaching, or planing. Power-designed Mattison Grinders have heavy integral construction features permitting higher horsepower . . . heavier wheel feeds . . . freer cutting action . . . greater accuracy . . . and more effective use of modern grinding wheels. Your Mattison dealer has complete details on all Mattison machinery.

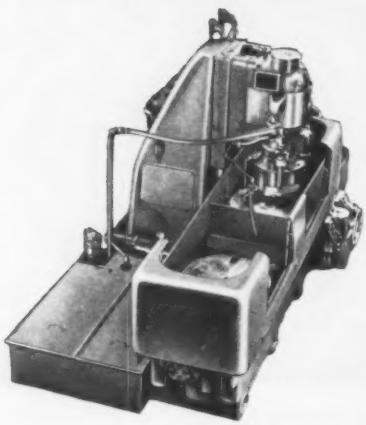
PRECISION HORIZONTAL SPINDLE SURFACE GRINDER—Rigidly built for a wide range of applications . . . 46 different tables, sizes available up to 36 x 192 in.



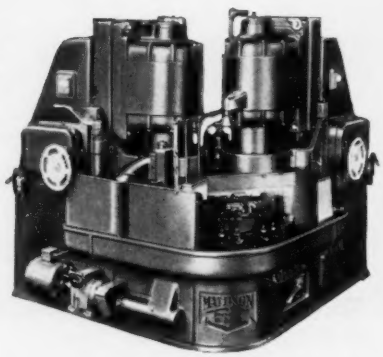
VERTICAL SPINDLE ROTARY SURFACE GRINDER—Two sizes for toolroom, die grinding, and general production . . . in 30, 40, or 50 hp . . . 30, 36, 40, or 48 in. tables.



SURFACE GRINDERS



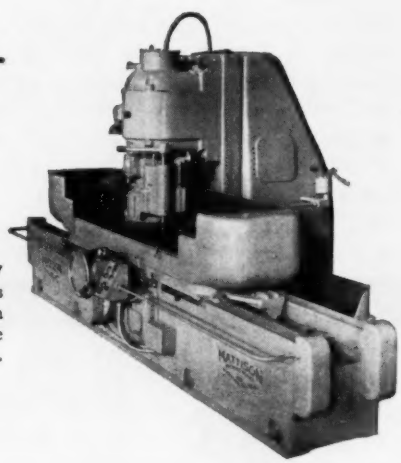
DUPLEX VERTICAL ROTARY SURFACE GRINDER—With two rotary chucks for reduction of down-time—set up one while other is under the wheel . . . 30 hp . . . 30 in. chucks.



TWO-SPINDLE ROTARY AUTOMATIC—For high-production single-pass grinding . . . 25 or 30 hp . . . 36, 40, or 43 in. tables . . . available with automatic sizing.



VERTICAL SPINDLE RECIPROCATING TYPE—In three series for knife and shear blades, machine parts, gear racks, etc. . . . table lengths from 36 to 190 in. . . . 10 to 100 hp.

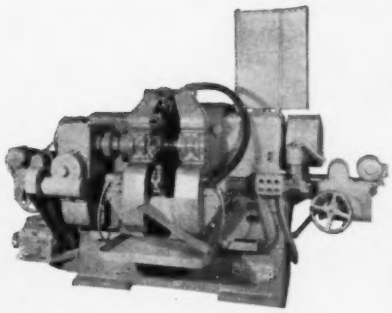


MULTIPLE-SPINDLE ROTARY AUTOMATIC—For single-pass grinding at extremely high production and close tolerances . . . three to five spindles . . . 20, 30, 40, or 50 hp . . . 72 or 100 in. tables.

extra rigidity...extra profitable features your plant needs in "Power-Designed" Mattison Grinders!

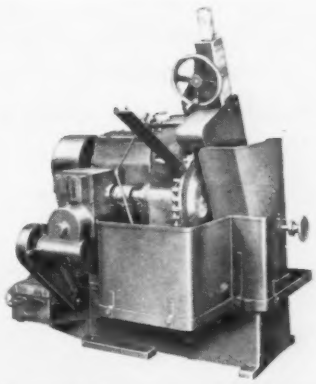
Call your Mattison Dealer to arrange for a sample grind of your parts in the Mattison Methods Laboratory.

DISC GRINDERS

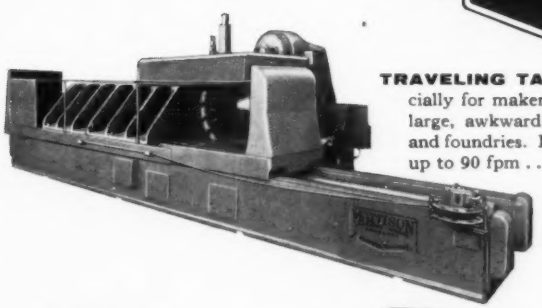


AUTOMATIC SINGLE SPINDLE—For high-production jobs on relatively small parts . . . automatic sizing and spindle feed . . . 3 or 25 hp . . . 14 or 24 in. diameter wheels.

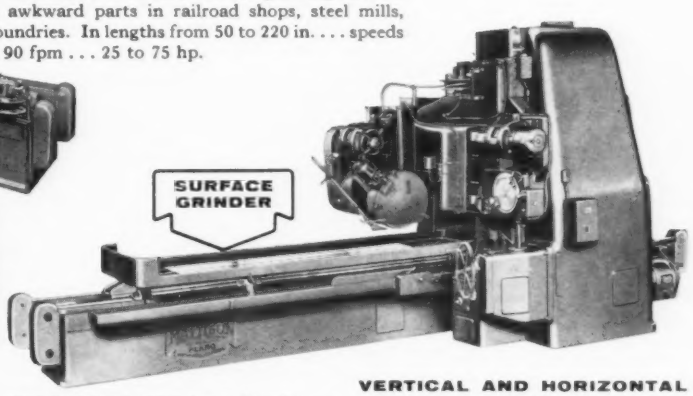
AUTOMATIC DOUBLE SPINDLE—For grinding two parallel opposite sides at one time . . . automatic sizing and spindle feed . . . in six sizes with 12 to 30 in. wheels . . . 3 to 50 hp.

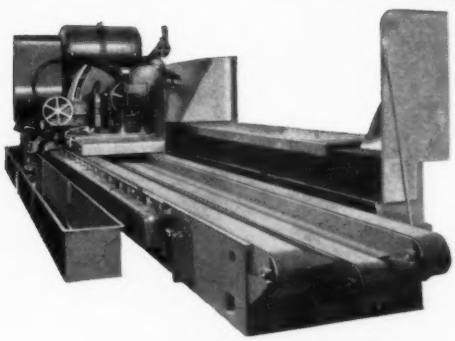


FACE GRINDERS



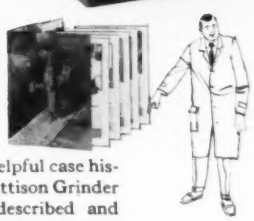
TRAVELING TABLE (HYDRAULIC)—Built especially for makers of blades, and for grinding faces of large, awkward parts in railroad shops, steel mills, and foundries. In lengths from 50 to 220 in. . . . speeds up to 90 fpm . . . 25 to 75 hp.





TRAVELING WHEEL—Useful on long, awkward parts . . . saves floor space . . . in 84 to 240 in. lengths . . . 12 to 30 fpm . . . 40 to 125 hp . . . 22 to 40 in. work space heights.

VERTICAL AND HORIZONTAL SPINDLE PLANOS—Largest, most effective machines for large work . . . . lengths, 120 to 288 in. . . . widths, 50 or 60 in. . . . 15 to 25 hp. Rotary types also available.



Applied Grinding Methods Available For Your Use

Informative and helpful case histories of actual Mattison Grinder applications are described and illustrated for you in this new booklet. Contact your dealer for your copy or write direct.

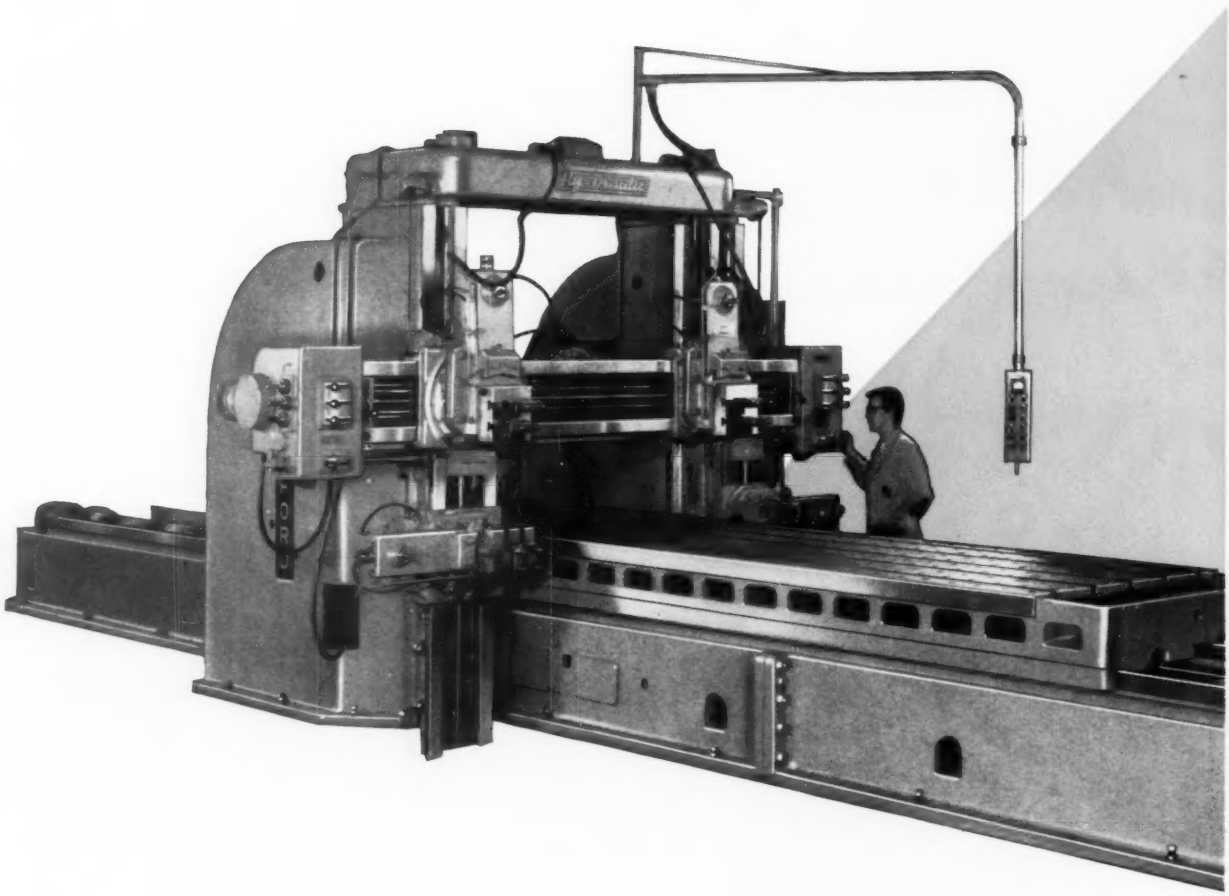
MATTISON MACHINE WORKS

ROCKFORD, ILLINOIS

MATTISON MACHINE WORKS ROCKFORD ILL. U.S.A.

If it's a flat surface, there's a Mattison to grind it.

versatility of triple circuit **h3** drive

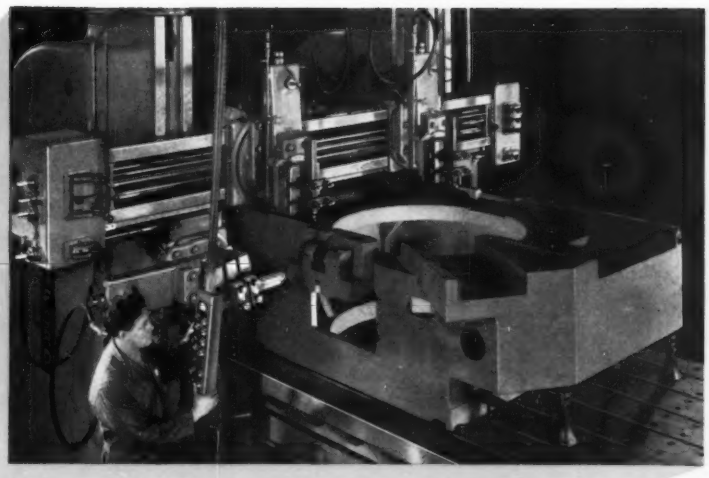




Machinery, February, 1957

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

shown with **4-TON** work piece!



MACHINED ON DOUBLE-HOUSING

ROCKFORD HYDRAULIC PLANER

A Rockford Double-Housing Hydraulic Planer machines this huge casting, using carbide tools on 2 railheads and 1 sidehead. The exclusive hydraulic triple circuit supplies 3 cutting speed ranges for flexibility in changing from one kind of work to another. Pendant control offers selection of low range to 100 fpm., for extreme depths of cut and maximum feeds; medium range to 150 fpm., for average cuts in medium steel or cast-iron; or high range to 300 fpm., for carbide planing of steel and non-ferrous metals.

It is possible for an operator to adjust the h3 drive from 10 to 300 fpm. at the normal operating position, instantly selecting the speed range ideally suited for his individual job application.

See your Rockford Machine Tool Company representative for complete information on the versatility of the new hydraulic triple circuit h3 drive for your production work.



h3 drive

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

GREENLEE OFFERS

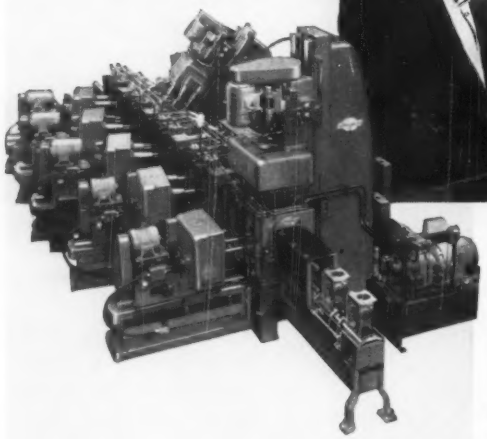
A PROFIT-MAKING INVESTMENT IN HIGH-PRODUCTION MACHINE TOOLS



Greenlee Six-Spindle Automatic Bar Machine.



Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.





Greenlee 10-Station Automatic Transfer Machine.

Greenlee creative thinking, Greenlee engineering and Greenlee experience combined with that of your own engineers will help you "produce more at lower cost."

Ideas, engineering, experience and facilities of Greenlee Bros. & Co. develop improved methods and machines for greater and greater productivity of future models.

Greenlee's adequate facilities expedite the transition from production ideas to production machines . . . a profit-making investment at work in your plant.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

Write for Further Information

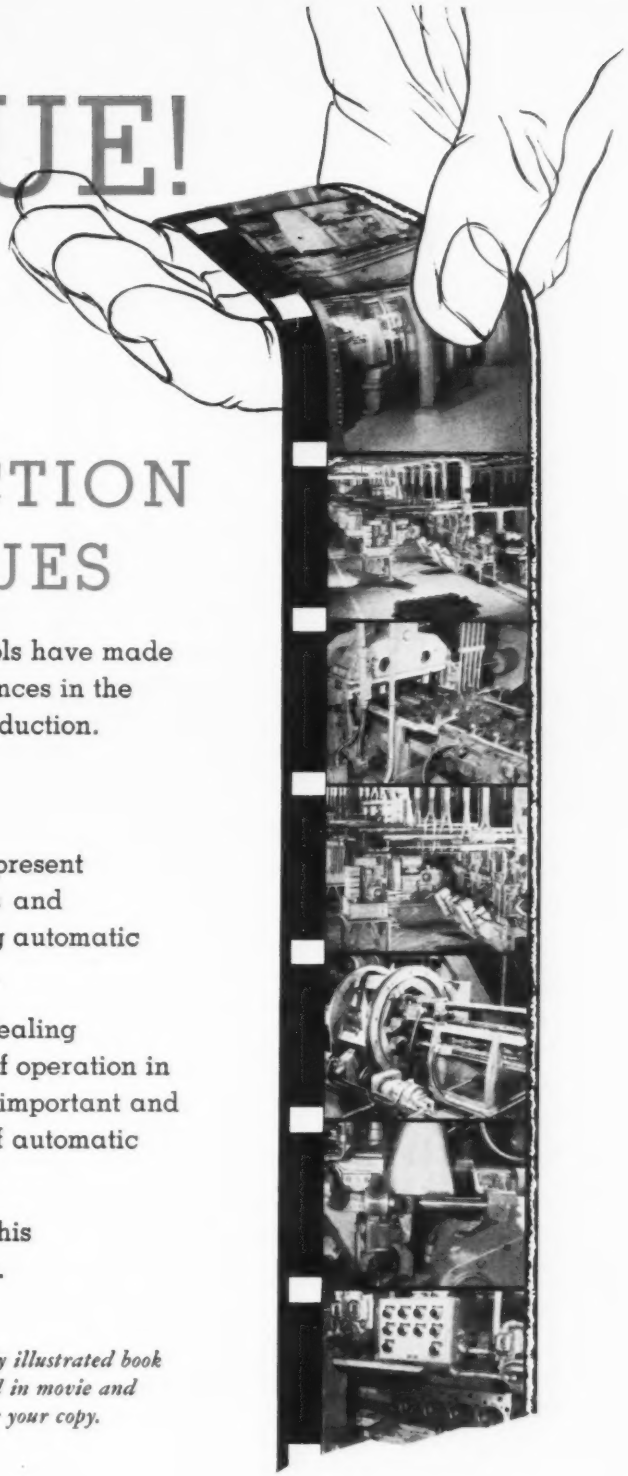
GREENLEE

GREENLEE BROS. & CO.
1862 Mason Ave.
Rockford, Illinois

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

UNIQUE!

AUTOMATIC MASS PRODUCTION TECHNIQUES



Barnes hydraulic controls have made possible revolutionary advances in the science of automatic mass production.

AVAILABLE FOR YOU:

- ✔ Sound film in color depicting present uses of hydraulic controls and actuations in advancing automatic mass production machinery.
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FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

"Engineered Production" Service

FOR BROACHING



It takes all 3

American's *"Engineered Production"* Service . . . gives the broach user the complete three-part service required to handle a production broaching job. It adds years of design and production engineering experience, unavailable at any price, to your staff at no extra cost.



THE JOB

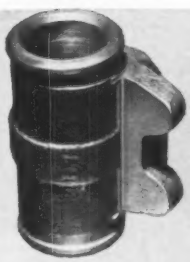
Broaching mounting face on rear wheel brake cylinders.

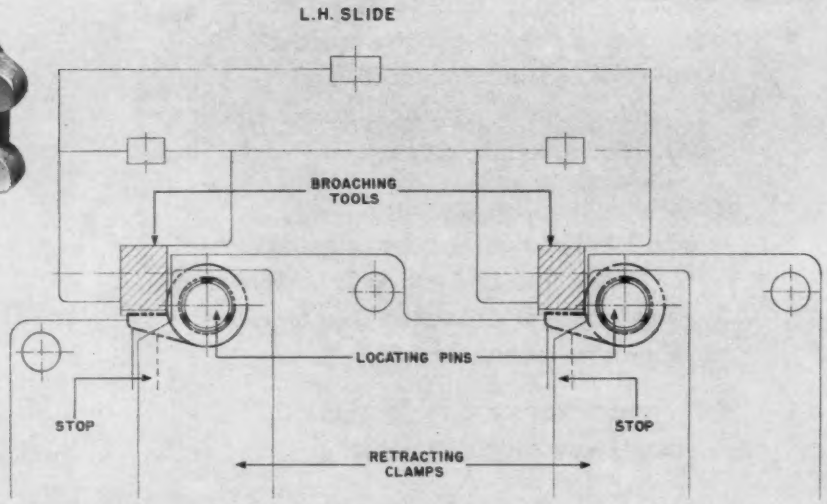
THE RESULT

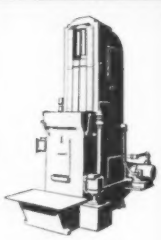
720 parts per hour broached two at a time on vertical dual-ram machine removing about ⅛ in. stock.

1 PROPER BROACH TOOL DESIGN

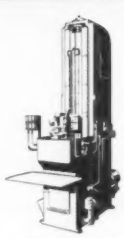
To insure top-quality results on any broaching operation the job must start with the design of the broaching tool itself. American Broach solves this all-important first step by considering: stock removal, length and width of cut, finish and tolerances required, etc. American's experience in designing and building broaches for every type of part capable of being broached pays off in quality of the work and in long tool life. You can be sure the broach and machine will operate as a team because they are designed that way.



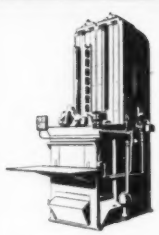




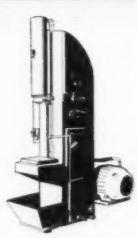
Three Way



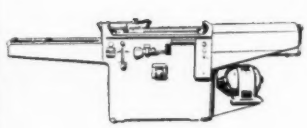
Single Ram



Duplex Ram



Presses



Horizontal

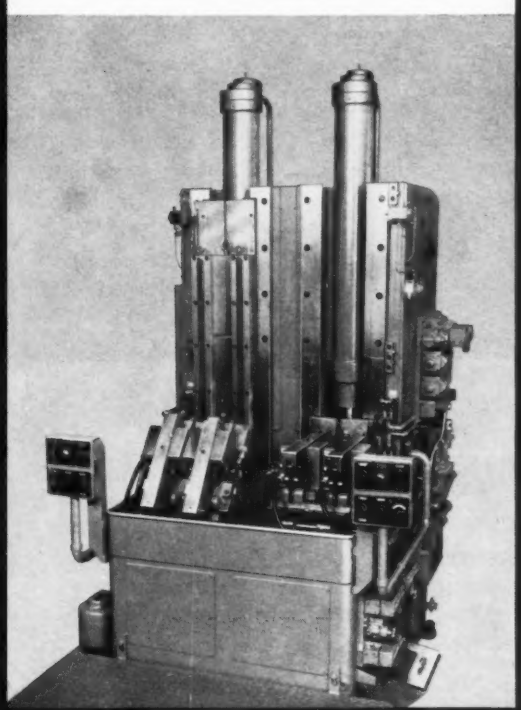


MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

to give you peak broaching performance

2 SPECIFYING THE RIGHT MACHINE

At American, machine selection is made after the design of the broaching tool. Production rate required, length and speed of stroke, relationship to other production machinery, and available floor space dictate the selection of the broaching machine capable of doing the best broaching job. From a manufacturer like American, who builds a complete line of standard machines and has extensive experience on specials, you can depend on getting the most practical machine for your job.



3 EFFICIENT FIXTURING

Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Whether manual loading and unloading is used or the work cycle is completely automatic, workholding fixtures designed and built by American Broach feature easy loading and unloading coupled with positive clamping during the broaching cycle. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.



WRITE for Bulletin A611 containing information on practical broaching methods by American.



SUNDSTRAND AMERICAN *American* BROACH & MACHINE CO.

A division of SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

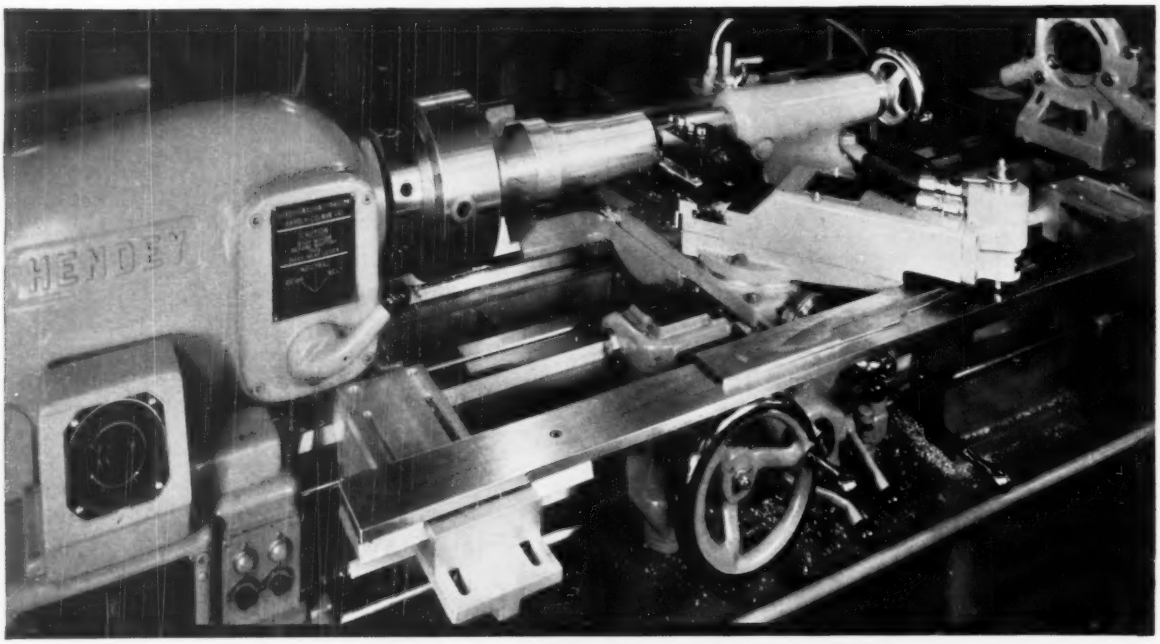


You get

top value per dollar

with a Hendey No. 2E lathe

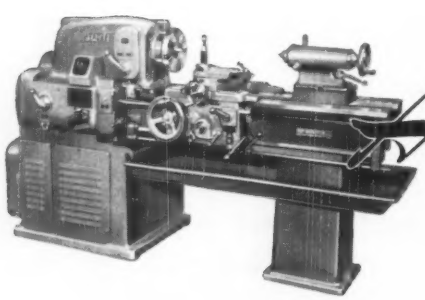
QUICK-CHANGE tracer attachment CUTS CONTOUR TURNING COSTS!



The precision performance and fast, easy setup of the new hydraulic tracer control introduce previously unheard-of economy wherever three or more pieces are to be step-turned. Available as optional equipment, the new tracer is a packaged unit which simply replaces the standard compound . . . no drilling required. Mounts on front of lathe where the flat template stays clear of chips and coolant.

The Hendey No. 2E is widely known as the multi-feature lathe offering top value at moderate cost. Electronic drive with fingertip stepless speed control gives unmatched ease of precision production and makes the Hendey No. 2E ideal for hydraulic tracer control. Contact your Hendey dealer for details and specifications.

for precision with production, buy Hendey



Hendey machine division

BARBER-COLMAN COMPANY

22 Loomis St., Rockford, Illinois

BARBER COLMAN ®



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**



high scorer

. . . and in high speed steels, it's always REX

Crucible's REX® high speed steel always scores highest on performance—as it has for more than a half century. That's because it is consistently sound and uniform in structure . . . with dependable response to heat treatment.

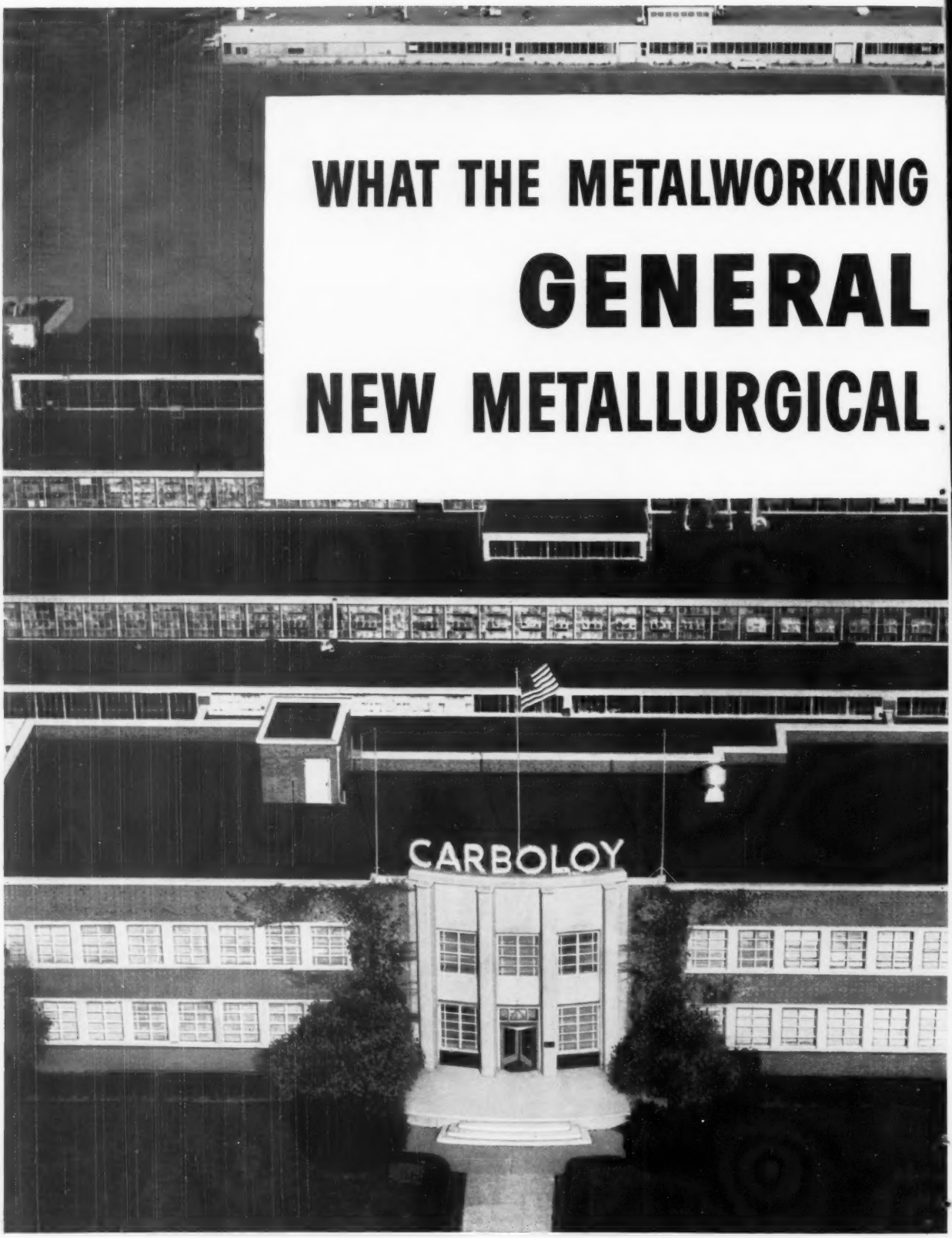
But don't take our word for it. Check REX for yourself—by any test you choose. You'll discover that recent improvements in manufacturing techniques have made it better than ever—why REX is today, as it's always been, *the standard by which all other high speed steels are compared!*

REX is immediately available at all Crucible warehouses, or on prompt mill delivery. For a list of helpful data on REX and other *special steels*, write for a free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

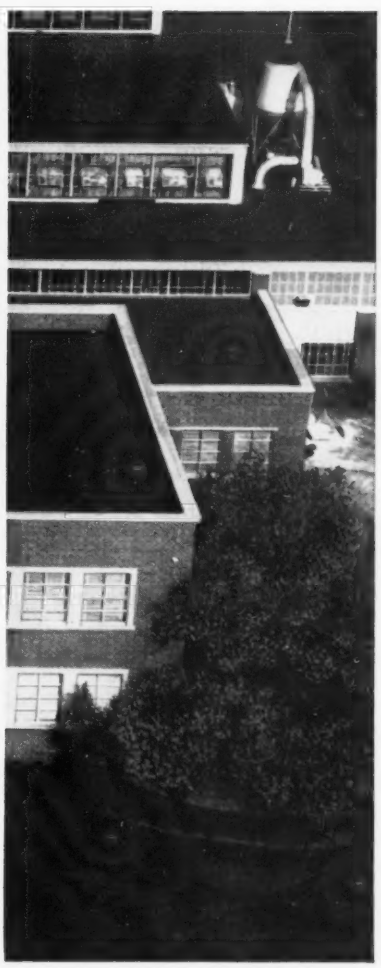
Canadian Distributor—Railway & Power Engineering Corp., Ltd.



Headquarters of the Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Ave., Detroit 32, Michigan. Carboloy Cemented Oxide and carbides are made here. G-E permanent magnets and specialty resistors are manufactured in the Edmore, Mich., plant.



INDUSTRY CAN EXPECT FROM G-E'S PRODUCTS DEPARTMENT



The new G-E Metallurgical Products Department is the successor to the Carboloy Department. Here's what this change will mean for you.

Since 1928, the General Electric trademark "Carboloy" has been identified with a brand of cemented carbide. But today, Carboloy® cemented carbides are just one of a broad range of products which bear the famous Carboloy trademark.

Cemented Oxide, the Machinability Computer, toolholders, diamond dressers, drawing and forming dies . . . these are on the market today. Tomorrow, you will see many other new-product developments for the Metalworking Industry.

With carbides like the new Extra-Performance Series 300 steel-cutting grades, these products are being made available to you through a distribution team which is unmatched in the carbide industry from the standpoint of inventory, delivery, and service.

In addition, the Metallurgical Products Department makes other products which carry only the General Electric trademark: permanent magnets, vacuum-melted alloys, hevimet, thermistors, and Thyrite®, varistors. And on the industrial horizon are G-E man-made diamonds.

Thus, the new departmental name symbolizes the broadened scope of this Department's activities. Equally important, it indicates how vitally interested General Electric is in the Metalworking Industry.

Many of the products listed above are the result of fundamental investigations carried out at the G-E Research Laboratory in Schenectady. Many new developments in machining, forming, and drawing techniques are the work of G-E Engineers. And, when new products and methods are developed for the Metalworking Industry by General Electric, they, too, will come to you from the Metallurgical Products Department.

Progress Is Our Most Important Product

GENERAL ELECTRIC

AVOID the HIGH COST and difficulty of fabricating long, hard & straight parts by conventional methods . . .

THOMSON

60 Case

hardened and ground

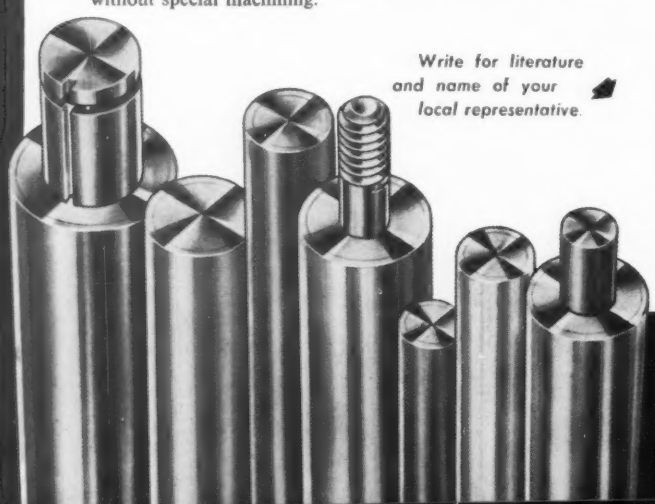
SHAFTS, ROLLS, GUIDE RODS and other long-round parts

60 Case is the result of over ten years of experimental work and production experience with hardened and ground shafts which are a requirement for BALL BUSHINGS, the Linear Ball Bearing manufactured by Thomson Industries, Inc.

The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished *60 Case* parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from ¼" to 4" are stocked to enable prompt shipment of *60 Case* parts, with or without special machining.



Write for literature and name of your local representative

ADVANTAGES of *60 Case*

- COST REDUCTION
- HARD BEARING SURFACE
- ACCURATE DIAMETERS
- GROUND FINISH
- STRAIGHT PARTS
- DELIVERY FROM STOCK
- ADDED STRENGTH
- UNIFORM HIGH QUALITY

TYPICAL *60 Case* PARTS

GUIDE RODS, SHAFTING, ROLLS, TRAVERSE RAILS, PISTON RODS, ARBORS, LEADER PINS, TIE RODS, KING PINS, AXLES, CONTROL RODS, GUIDE POSTS, MANDRELS, BEARING ROLLERS, SPINDLES

THOMSON INDUSTRIES, Inc.
Dept. C6, Manhasset, New York

Crucible gives you

wide selection,

dependable delivery of

Cold Rolled Specialty Steels



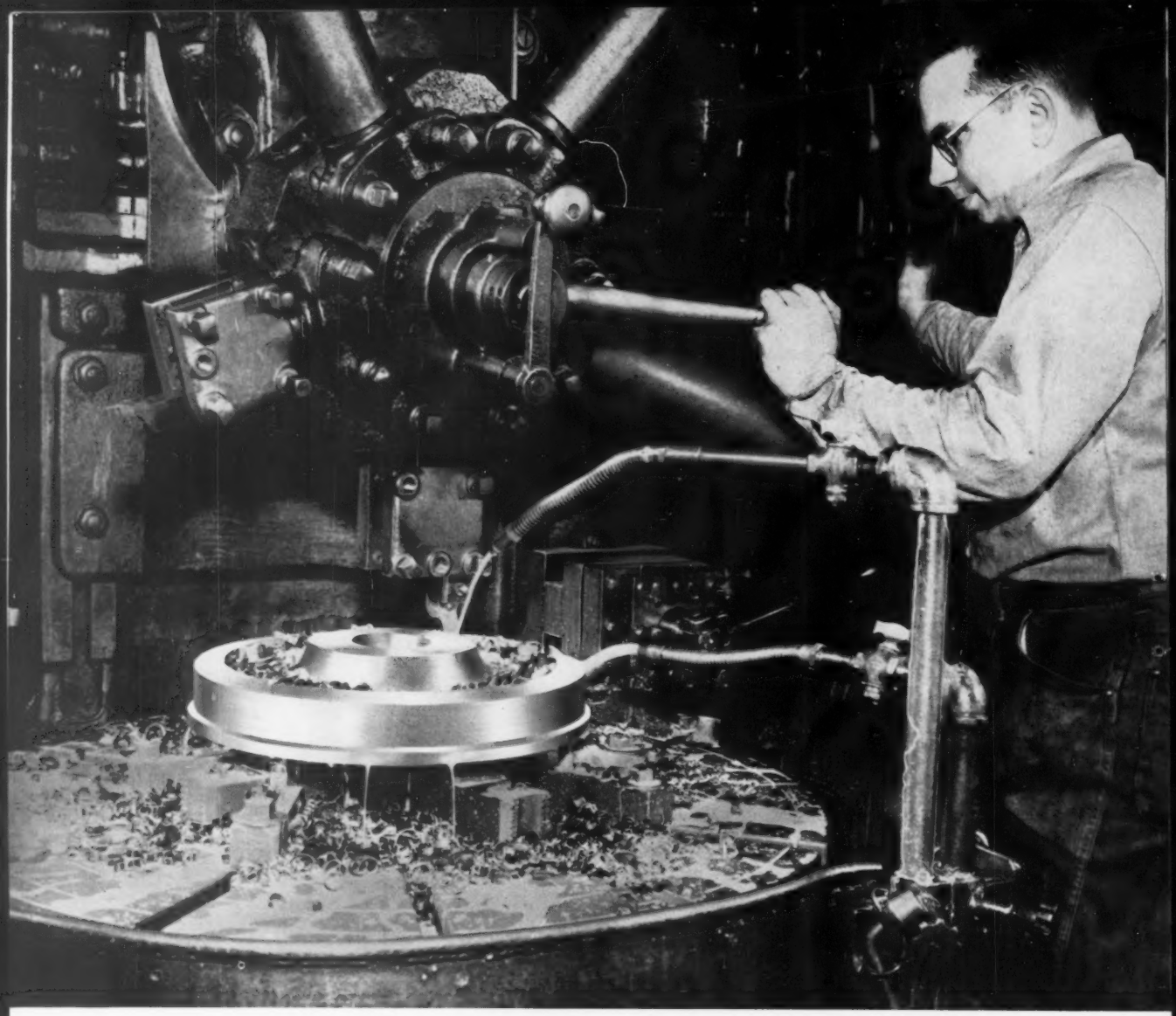
For a *full* selection of cold rolled specialty steels – call Crucible. Deliveries are on-schedule – in the size, grade, finish or length you need.

And Crucible's new mill facilities mean closer control of rolling . . . insure greater physical uniformity . . . fine finish . . . better edges . . . flatter strip.

Whether you use carbon spring steel, alloy strip steel, or many other ferrous analyses that can be cold rolled, you can't beat Crucible. More information is contained in the 32-page booklet, "Cold Rolled Specialty Steels". Write for your free copy now. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



Another Good Gear on the Way

Here's a piece of work that is destined to become a transmission gear. The machinist has found it easy going because of the highly dependable blank he's using. Right from the start, he has had smooth sailing.

The blank was made by Bethlehem's forging-and-rolling process, a method of manufacture that is unique. By combining both forging and rolling in a single operation, this process imparts uniform density and smooth, regular grain flow. As a result, the metal cuts away cleanly and fast, and there is no hidden trouble to plague the machinist.

This is important. But even more important is *strength*. In Bethlehem blanks, there's strength in abundance—the strength and soundness essential for gears, crane wheels, sheaves, flywheels, and other circular products.

These sturdy steel blanks can be furnished in sizes to 46 in. OD, so there's a wide range of choice. There's also available an excellent variety of sections.

For full details, we suggest you call our nearest sales office—or write for Booklet 216, which contains more than 80 photographs and a wealth of helpful information.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

DO YOU NEED BETTER METAL CLEANERS FOR THESE JOBS?



Will you take a few seconds to check this list and circle in the coupon the numbers of the jobs on which you need better results?

1	**Cleaning aluminum in preparation for anodizing.** See pages 4 to 8 in "How to clean metals in aircraft production."
2	**Cleaning and deoxidizing aluminum in preparation for spot welding.** See pages 10 to 14.
3	**Cleaning and conditioning aluminum in preparation for painting.** See pages 15 to 19.
4	**Cleaning aluminum after heat treating.** See page 20.
5	**Stripping paint from aluminum.** See pages 22 to 26.
6	**Cleaning magnesium.** See pages 27 to 29.
7	**Controlling overspray in paint booths.** See pages 36 to 37
8	**Cleaning engine test cells.** See page 40.

FREE Write for your copy of this 48-page illustrated booklet.

Oakite Products, Inc., 26 Rector St., New York 6, N. Y.

Send me a FREE copy of your booklet *"How to clean metals in aircraft production."*

I am interested in getting better results in the cleaning jobs indicated by the numbers I have circled below:

1 2 3 4 5 6 7 8

NAME_____

COMPANY_____

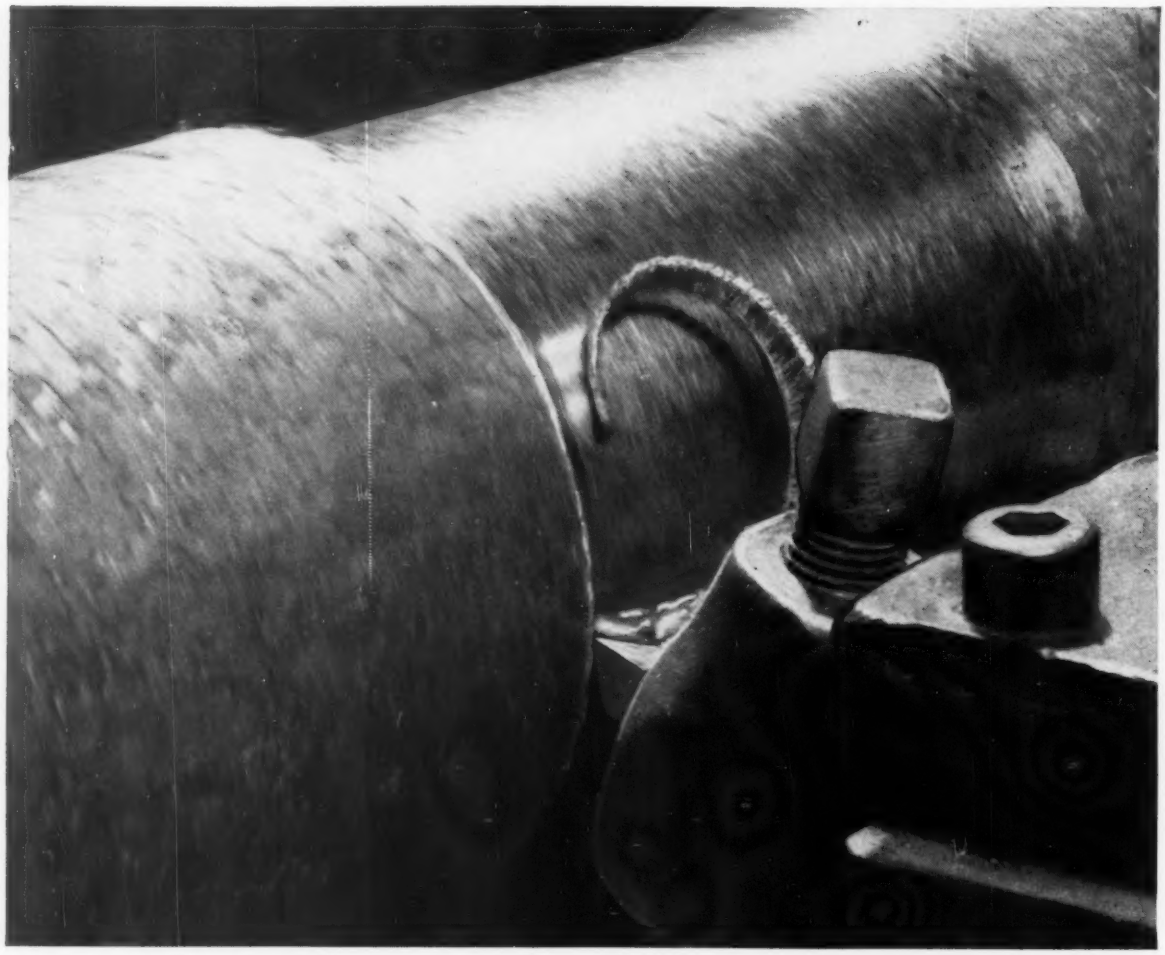
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Technical Service Representatives in Principal Cities of U. S. and Canada

Export Division
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SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS / METHODS / SERVICE
SCIENCE

For more information fill in page number on Inquiry Card, on page 239



One Pound of Metal Removed Per Minute

Two HAYNES STELLITE alloy tools remove 118 cubic inches of metal from rough, uneven nickel-chromium billets in 20 minutes. They trim $\frac{1}{2}$ in. from the diameter in one pass, and finish two of the 170-lb. billets per grind. Each tool removes about a pound of metal per minute in spite of the irregularity of the billet. Cutting speed is 37 surface ft. per minute and the rate of feed is $\frac{5}{8}$ in. per minute. Heat generated during the cutting operation quickly dulled the cutting edges of high-speed steel tools tried on this job, and the rough cut caused other tool materials to chip. Only HAYNES STELLITE 98M2 cobalt-base alloy tools proved to be both hard and tough enough to do the job efficiently.

HAYNES STELLITE alloy tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they take deep cuts.

More information on HAYNES STELLITE tools and how they can be used to best advantage is contained in the booklet, "HAYNES STELLITE Metal-Cutting Tools." Write any of the district offices listed below for your copy.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

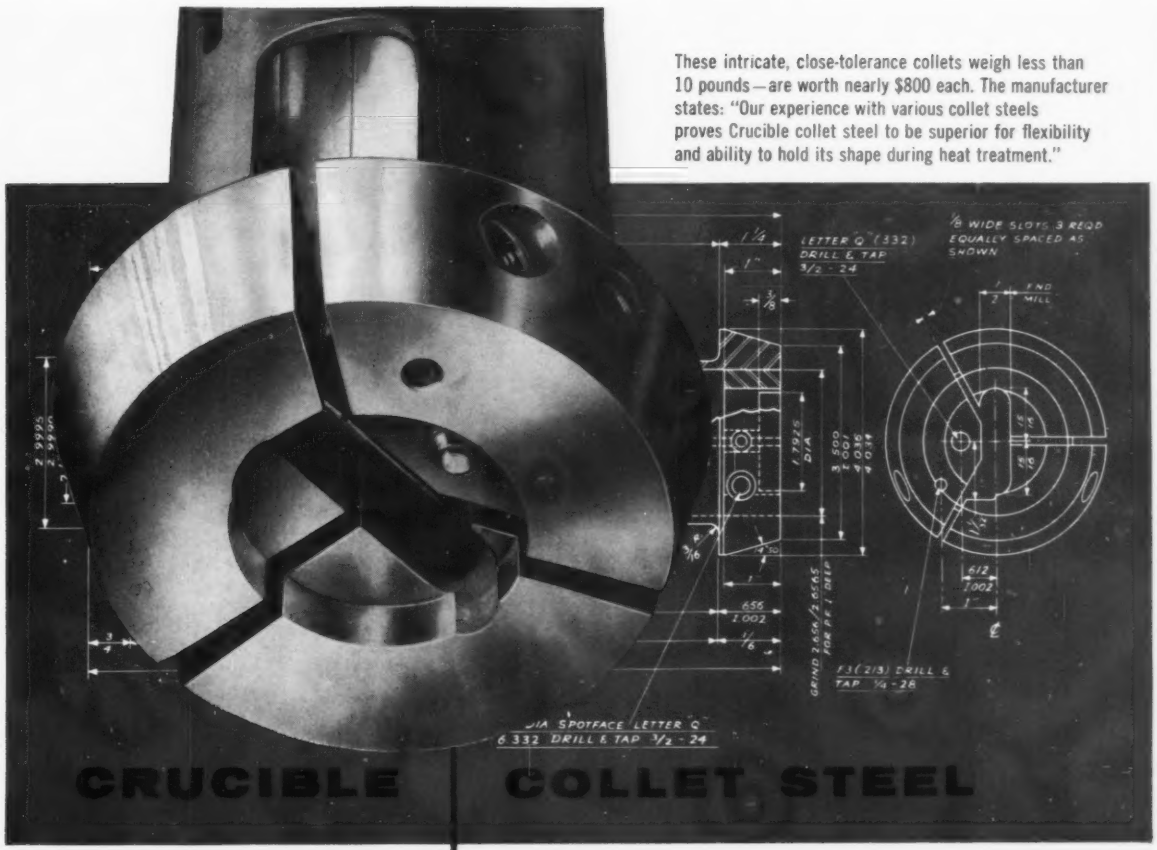
UCC

General Offices and Works, Kokomo, Indiana

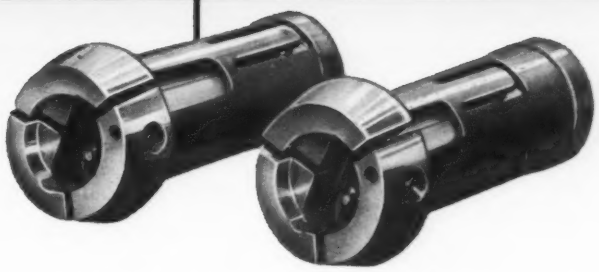
Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.



These intricate, close-tolerance collets weigh less than 10 pounds—are worth nearly $800 each. The manufacturer states: "Our experience with various collet steels proves Crucible collet steel to be superior for flexibility and ability to hold its shape during heat treatment."



for minimum distortion after heat treatment

These collets are used in machining the anchoring end of jet engine turbine blades, while locating the part from reference points on the airfoil section of the blade. It's a job that demands a steel which will not distort during heat treatment. The collet head is heated to Rockwell 58-60 C—the body tempered to 35-38 C.

The steel used is a special Crucible non-warping alloy collet grade. The collet manufacturer, Balas Collet Mfg. Co., Cleveland, Ohio, reports: *The extreme accuracy built into these collets while they are still in the soft state shows less than .0005" distortion on any dimension after heat treatment.*

Crucible collet steel was developed specifically for spring collets—or *any* parts with rigid requirements of excellent machinability and high attainable hardness. Other properties—in almost limitless combination—can be had in other Crucible alloy grades. To see what information is available on these alloy steels—or *any* Crucible special steel—get your copy of the *Crucible Publication Catalog*. Write *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

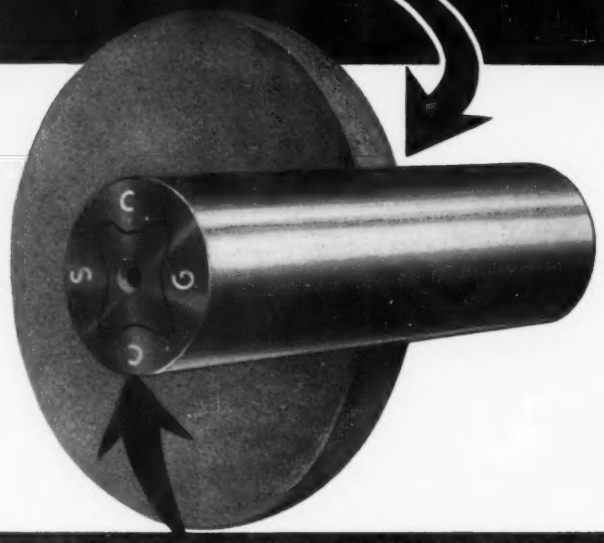
Crucible Steel Company of America

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,
smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845 **INCORPORATED 1892**

For more information fill in page number on Inquiry Card, on page 239

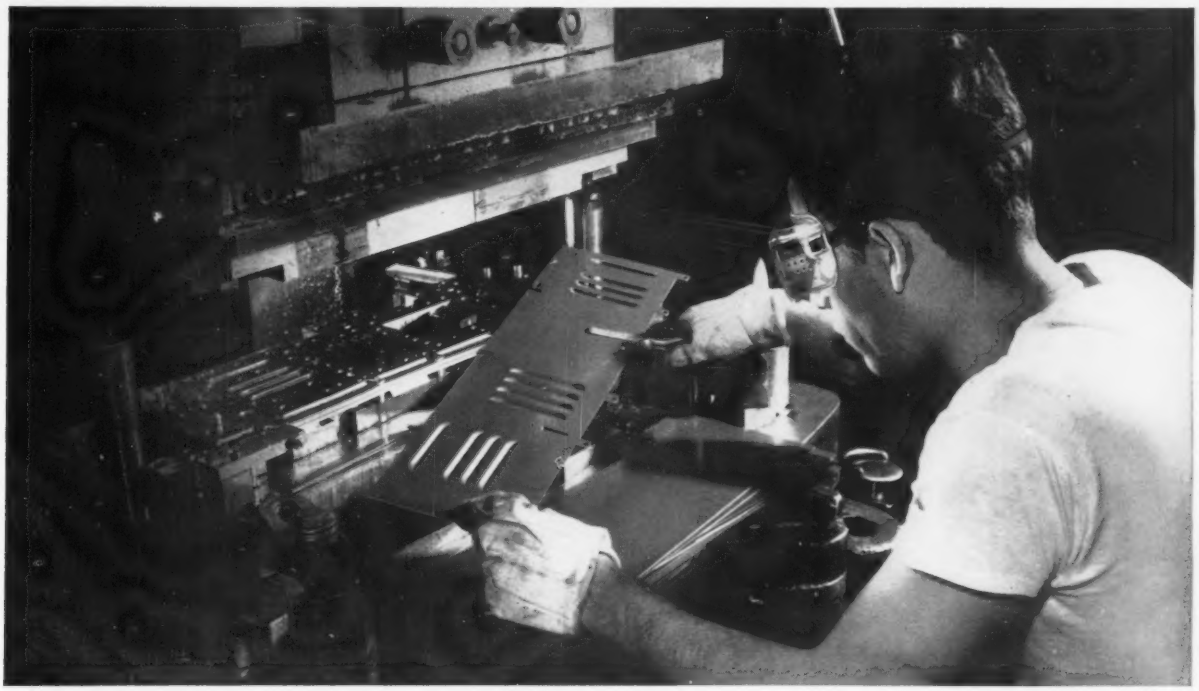
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

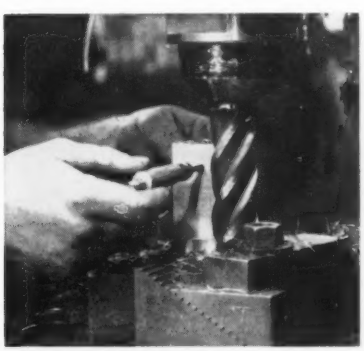


Maker of Parts for TV Sets Gets Good Results with BTR

Here's a job where BTR (Bethlehem Tool Room) tool steel gets a good chance to show what it can do. The multiple-purpose die is used by Suckle Electronics Company, Camden, N. J., to pierce, notch, louver and form high-voltage shields for TV sets. The shields are made of 16-gage steel, and are turned out in a 95-ton press at the rate of more than 400 pieces per hour.

Engineers at Suckle Electronics report that they are well satisfied with BTR. They particularly like its safe-hardening property, toughness, and ability to wear and wear.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. It's a grade that is consistently racking up substantial shop savings for manufacturers in a wide range of applications. Your Bethlehem tool-steel distributor will be more than pleased to furnish complete information about BTR. Why not give him a phone call right now, while you have it in mind!



CR-MO-W Gets the Okay

After being machined by the end mill, this hot-piercing punch, made of Bethlehem Cr-Mo-W (chrome-moly-tungsten) tool steel, gets final size check by micrometer. Cr-Mo-W, an excellent hot-work steel, contains 5 pct chromium. Because of its characteristics, it is perfectly at home on jobs that involve shock, drastic changes of temperature, and heat-checking.

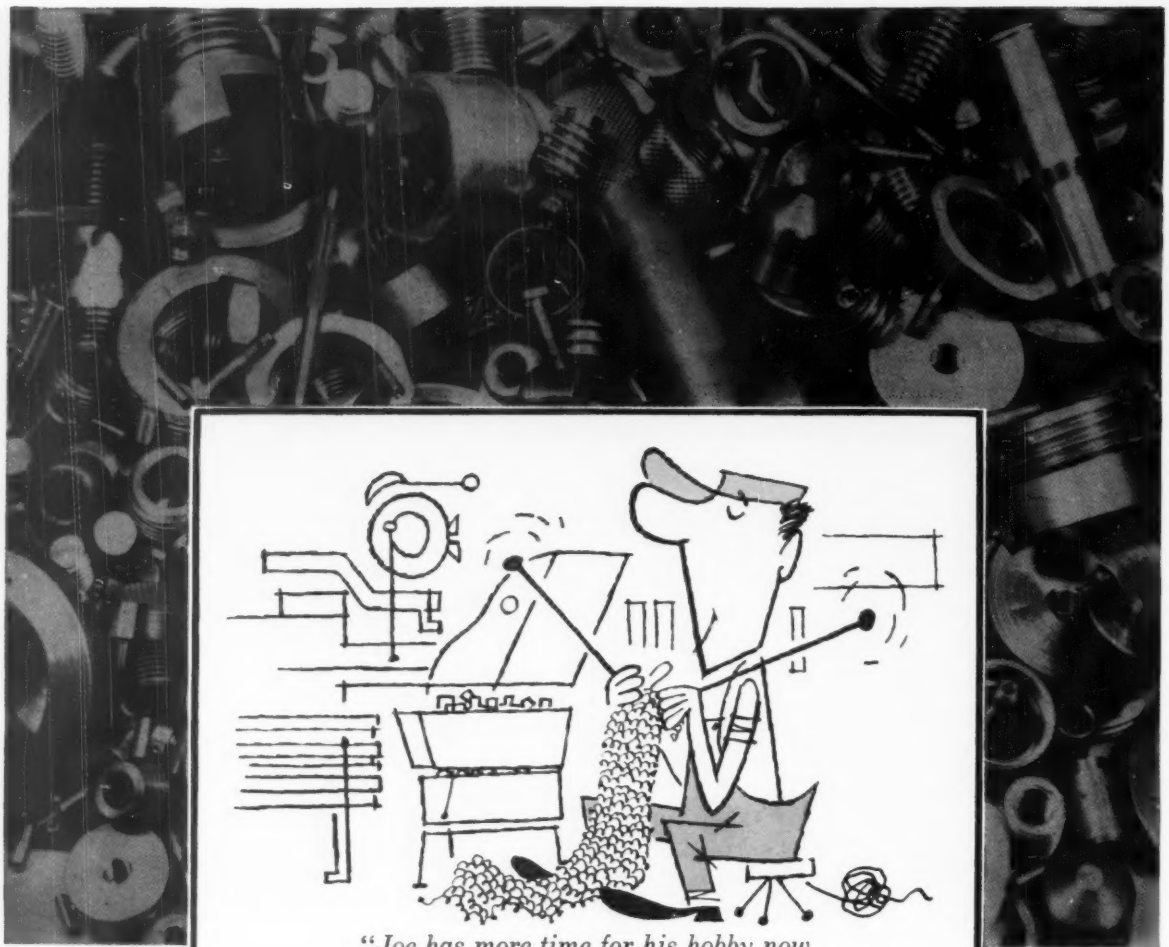
BETHLEHEM TOOL STEEL ENGINEER SAYS:



Don't Double Everything!

Attempting to double everything may be a wise policy in the investment field. But it can cause trouble when applied to the selection of tool steels. For example, when a successful production line is to be duplicated in larger size, the same grade of steel should not be used for each part without further consideration.

The main difficulty which arises is that the steel for a given part may not have sufficient hardenability when the part is to be made in a larger size. The reason is that tools which have been only partially hardened through will not be as strong as the deeper hardened or through-hardened tools of the original model. Secondly, the use of low-hardenability steels may be troublesome because the larger tools may be under-tempered in attempting to develop the desired degree of surface hardness. You may find that tools which are improperly tempered sometimes crack in treatment, grinding, or in service. Steel for each tool must therefore be selected with reference to the size in which the tool is to be produced.



"Joe has more time for his hobby now —we've switched to MX"

It's surprising what a difference USS Free-Machining MX Steel can make. Parts come off the machine faster—tools last longer—there's less down time—rejects are practically eliminated.

No wonder that hundreds of shops, where this high-speed, fast-cutting bar stock has been put to work, report substantial *cost savings.* These savings average between 10 and 15%; in some cases have run as high as 42%. With MX they're not only getting more parts per hour but better parts—more accurate and of finer finish—at lower cost per part.

Why not switch to USS Free-Machining MX? *It costs no more than regular screw stock,* yet it has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today.

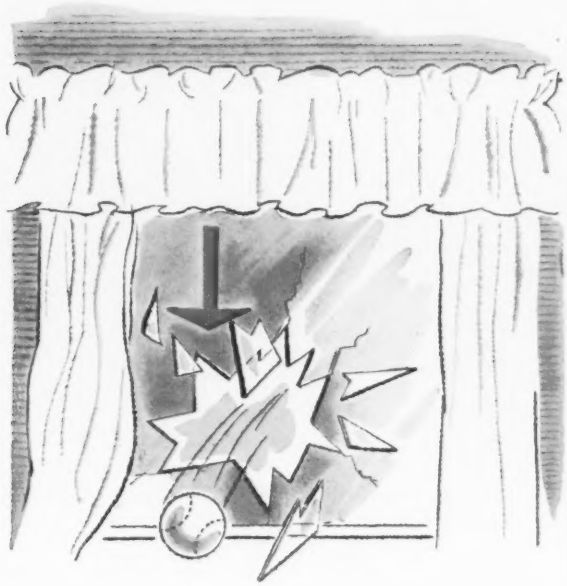
Production-boosting, cost-reducing MX steel is produced in all the popular screw stock sizes. It is available in both Bessemer and Open Hearth grades. You can obtain it in cold-finished form from your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output . . . longer tool life . . . lower costs

USS *—when you do the job with free-machining* **MX**

UNITED STATES STEEL



a hole here means work...



a hole here saves work

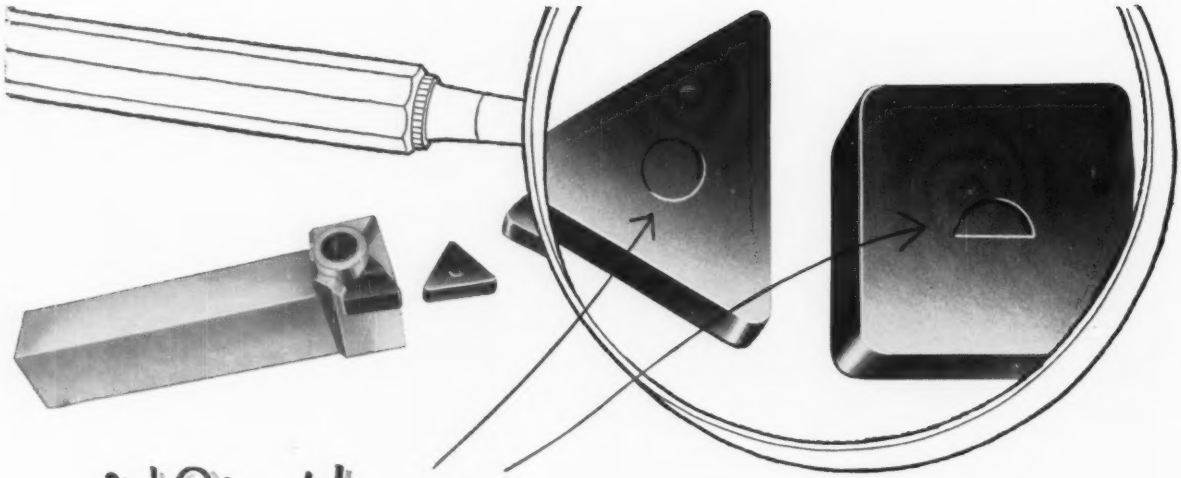
Crucible Hollow Tool Steel Bars take much of the work out of making ring-shaped steel parts, or tools with a center hole. The hole's already there. You save expensive drilling, boring, cutting-off and rough-facing operations . . . you reduce machine time and scrap losses.

You can now get Crucible Hollow Tool Steel Bars in any of the famous Crucible tool steel grades, in virtually any I.D. and O.D. combination. And you can get *immediate delivery* from stock of the five most useful grades — KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot-work tool steels.

Your Crucible representative can quickly show you how Crucible Hollow Tool Steel Bars will save you work and money. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



NOW! CARMET TOOL HOLDER INSERTS ARE PERMANENTLY MARKED FOR POSITIVE GRADE IDENTIFICATION

SYMBOL		CARMET GRADE	APPLICATION	INDUSTRY DESIGNATION
■ ■	Square	CA-4	Machining cast iron and nonferrous material	C-2
◓ ◓	Semi-circle	CA-605	Precision boring steel Light, fast cuts	C-8
▲ ▲	Triangle	CA-606	Light, fast machining on steel	C-7
● ●	Circle	CA-608	Light to medium machining on steel	C-7
◆ ◆	Diamond	CA-609	General machining on steel Medium to medium heavy cuts	C-6
▬ ▬	Rectangle	CA-610	General machining on steel Heavy roughing cuts	C-6



Write for your copy of "Carmet Tool Holders and Throw-Away Inserts"

12 page catalog containing specifications of Carmet tool holders and inserts. Also data on replacement part kits for tool holders and other useful information.

ADDRESS DEPT. M-86

Now you can avoid costly, confusing carbide grade mix-ups that affect production, complicate stockroom procedure and generally upset routine. A positive system of grade identification assures you the *right* Carmet blank for every job.

Each Carmet blank is permanently marked with a symbol that tells instantly and conveniently its grade and its job application.

For all your metal-removing operations, specify the *Partners in Performance:* Carmet tool holders and Carmet tool holder inserts. There are 90 different styles and sizes of Carmet tool holders to choose from, and 20 different sizes of Carmet inserts available in six different carbide grades . . . either utility or precision ground. ● Let us show you the convenience and economy of Carmet tool holders and throw-away blanks. Call your nearest A-L representative or distributor, or write *Allegheny Ludlum Steel Corporation, Carmet Div., Detroit 20, Mich.*

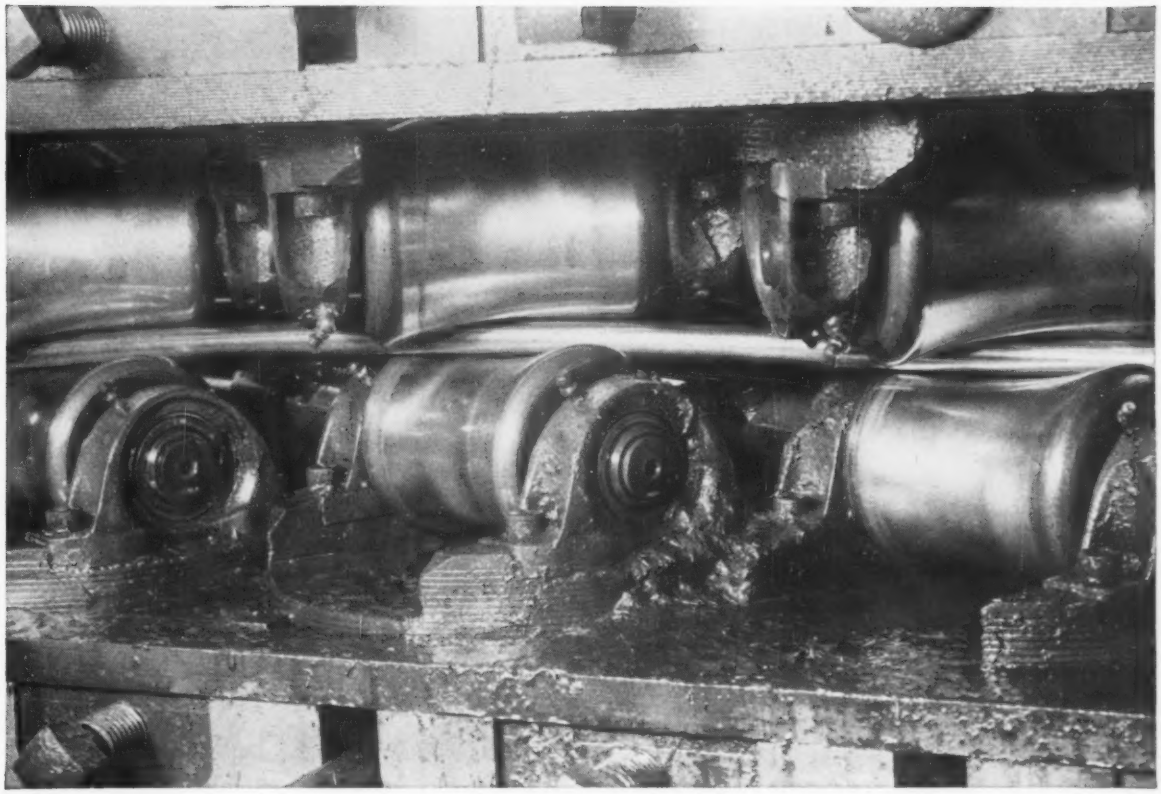
For ALL your CARBIDE needs, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

WSW 6390

For more information fill in page number on Inquiry Card, on page 239



Uses tool steel that outwears others 3 to 1 for its straightener rolls

TO help its customers get the longest possible life out of the rolls used in its small tube straighteners, Mackintosh-Hemphill Division of E. W. Bliss Co. makes them from Graph-Mo® steel.

Graph-Mo contains millions of tiny particles of diamond-hard carbides. As a result, users report it outwears other tool steels on an average of three to one!

Graph-Mo steel also contains free graphite which gives it outstanding anti-friction properties, prevents pick up and scoring. This is a big advantage to users of small Mack-Hemp straighteners because it results in a better surface on the products being processed. What's more it eliminates chrome plating the rolls, which is usually necessary when the straighteners are used for non-ferrous metals such as brass.

Graph-Mo steel gives Mackintosh-Hemphill two other important manufacturing advantages. It saves machining time because it's 30% easier to machine than ordinary tool steels. And it simplifies heat treating because of its uniform response to heat treatment.

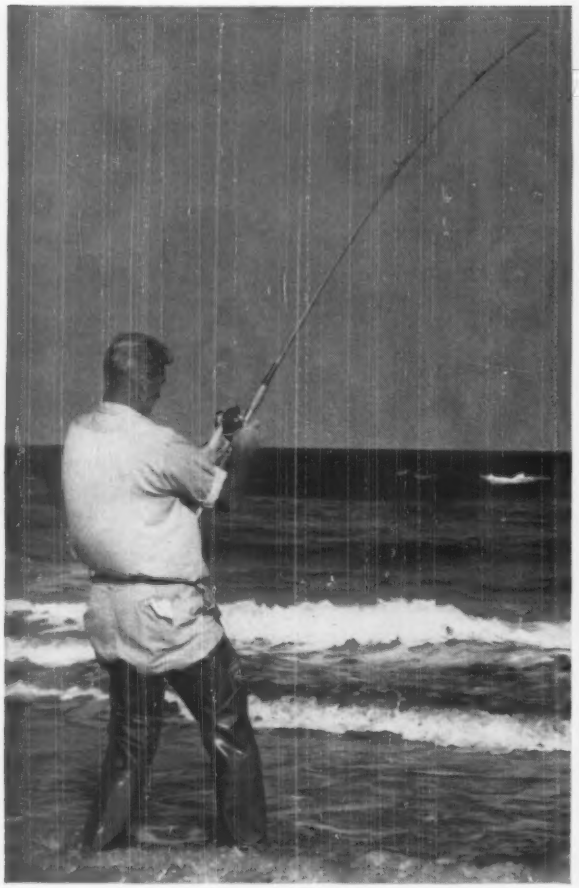
Graph-Mo is one of four graphitic tool steels developed by the Timken Company. If you want more information about their use in dies, punches, gages and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

For more information fill in page number on Inquiry Card, on page 239





Carpenter Free-Machining Stainless eliminates expensive handwork on fishing reel shaft

Excessive burrs when machining this level wind shaft for a fishing reel were constantly interfering with maximum productivity. Other important factors on the job are good corrosion resistance, and long wearing qualities.

Seeking improvement not only in the product, but also in its manufacture, the company decided to try Carpenter Stainless No. 5 (Type 416). The results were exactly as anticipated . . . easier, more uniform machining properties and burr-free finishes took the job out of the doubtful class and made it a profitable operation. No. 5 eliminated expensive hand work on the shaft, and put this job on a profitable, productive basis.

If you're not now using Carpenter Free-Machining Stainless, here's a real opportunity to improve production of stainless parts and products. For immediate delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor.

Carpenter STEEL

Free-Machining Stainless Steels

The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

For more information fill in page number on Inquiry Card, on page 239

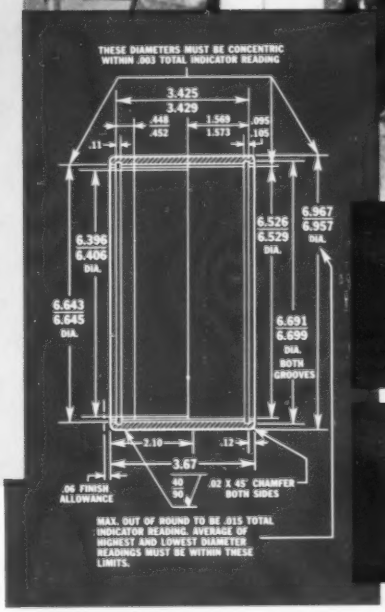
Automobile Manufacturer produces

Repetitive Pieces to Close Tolerances with

BULLARD MULT-AU-MATIC Type "L"



At one of the nation's largest automotive plants, a number of Bullard Mult-Au-Matics, Type "L" are employed to produce automatic transmission parts. According to the Process Engineer "The transmission is the most precision piece of equipment in the entire car — with many moving parts fabricated to close tolerances."







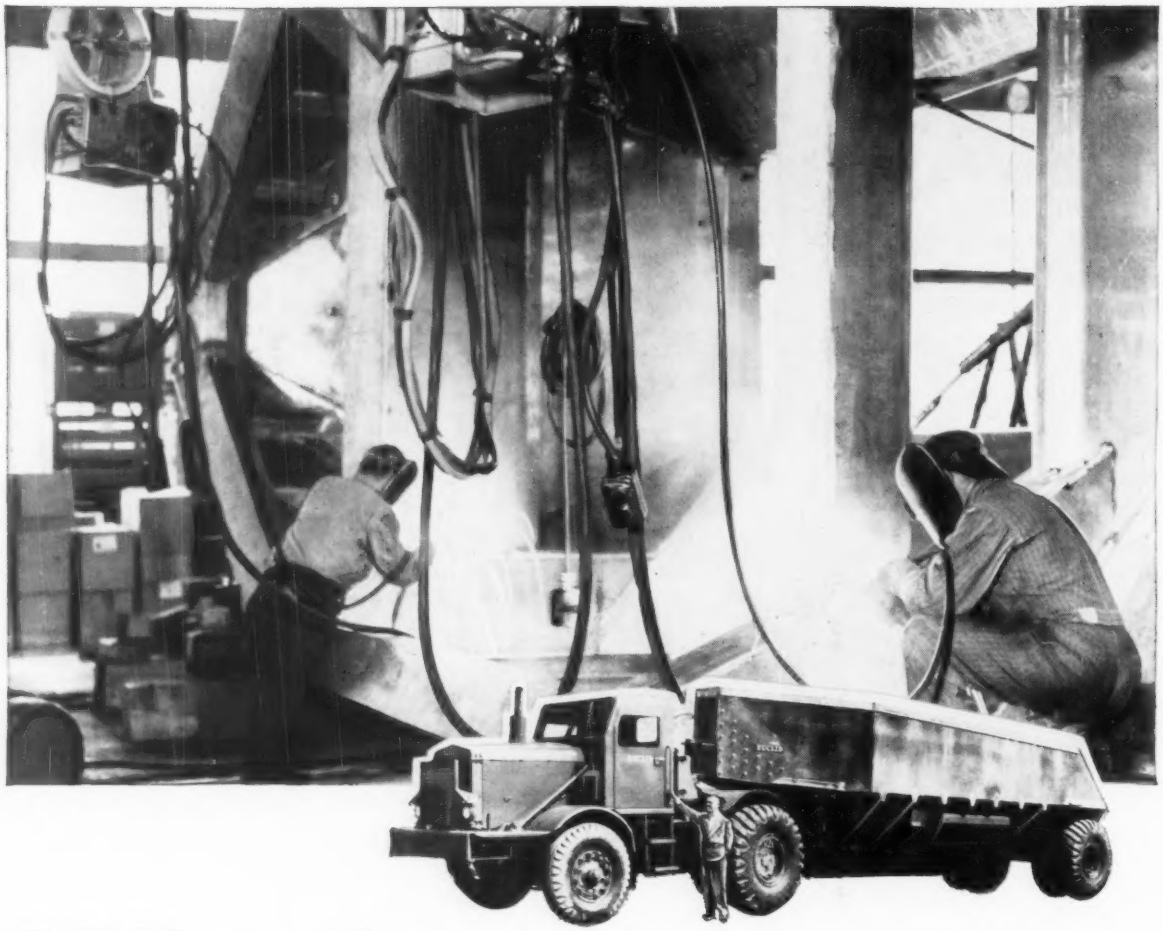
If you have need to manufacture to exacting tolerances it will pay you to investigate the many advantages offered by Bullard Mult-Au-Matic, Type "L".

Send for catalog today

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Please send me a copy of the
NEW MULT-AU-MATIC, TYPE "L" CATALOG

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COMPANY _____
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CITY _____ ZONE _____ STATE _____



33% Lighter...

Sigma Welding helps up truck pay-load 5 tons

The less weight consumed in a truck's structure, the more room there is for the all important pay-load. By sigma welding these giant drop-bottom dump trailers of sturdy aluminum alloy, 8,210 lb. dead-weight has been eliminated —and truck capacity increased 5 tons.

In this operation, sigma rod feed units are suspended above the work area to allow each operator complete freedom of movement with his sigma torch. Sigma welding operations are fast, and finished welds are of highest quality. The 36-ft. long trailers are fabricated of $\frac{5}{16}$ and $\frac{3}{8}$-in. plate, and $\frac{3}{8}$ and $\frac{3}{4}$-in. channel extrusions.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding with argon shielding. Sigma welding produces smooth, high-quality welds in all type joints, and exceeds 100 in. per min. in many operations. It is an efficient method for joining such metals and alloys as carbon steel, stainless steel, copper, bronze, aluminum, and unalloyed titanium. Start saving now with greater production speed and unit quality—call your local LINDE representative today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
(formerly Dominion Oxygen Company)
Division of Union Carbide Canada Limited, Toronto

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Linde
Trade-Mark

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TOOL NEWS
carbide



New WESSON design cuts cutter costs

"No Grind" Cutter Writes Milling History

Judging from a nationwide survey of metalworking, industry is eagerly looking for a new type of milling cutter, embodying the features to be found in Wesson's newest "no grind" series. Among these features are:

1. **No Cutter Grinding**—Use of low cost throw-away inserts eliminates blade or cutter grinding.
2. **Lower Blade Cost**—Ability to use throw-away inserts with 'commercial ground' thickness tolerances. Precision grinding of faces not necessary.
3. **Quicker Blade Index and Change**—Locking mechanism has only 2 parts—a wedge which forms the chip gullet and a screw which locks and unlocks blade with a half turn.
4. **Automatic Accurate Blade Locating**—Just drop the blade in a clean slot. It locates itself.
5. **Less Down-Time for Tool Changes**—Automatic blade locating when indexing and quick lock-unlock features reduces tool change time to the minimum.

(continued on page 2)

THROW-AWAYS... HOW FAST ARE THEY COMING?

Throw-away tooling is bidding fair to take over a lion's share of metal cutting—both single and multiple point.

Would you like a copy of the first detailed report on the Wesson-sponsored nationwide study on the future of 'throw-aways'? Drop a line on your company letterhead to "Market Research Director", Wesson Company, 1220 Woodward Heights Boulevard, Ferndale 20, Michigan, and he'll be glad to see that you get a copy.

TOOL NEWS carbide

COST CUTTING IDEAS FROM OTHER SHOPS

Have you tried these?

(Continued from a previous issue of Carbide Tool News)

Interchangeability Charts—Something that tells you quickly on what operations you can use identical or similar size tools. Helps to re-assign tools to other jobs on other parts, cuts inventories, insures maximum tool use. One large company is saving $15,000 to $20,000 per month with such charts.

• • •

Progressive Costs—One company reports big reduction in scrap and much better cost-consciousness of workers by telling them how much is invested in a part by the time it reaches them. The part is mounted on a board at each key operation. Alongside is lettered the cost of that part *up to that point.*

• • •

Fault Finding Committees—Putting criticism to work can pay off. Committees can be composed of process, methods and tool engineers who have to meet every so often and come up with criticisms and suggestions of things that probably could be done better some other way. They don't have to agree on what is the best way. The idea is to agree that what you are doing is not the best. Frequently come up with real cost cutting ideas.

• • •

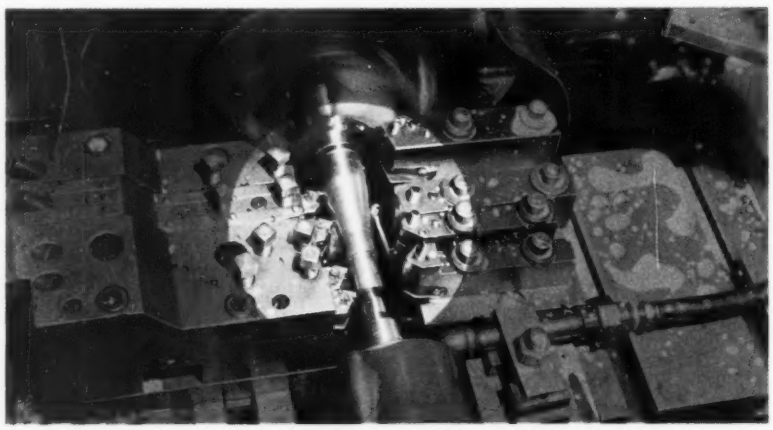
Program Tooling—When tooling up on any operation for the first time, don't just buy tools; buy the brains of a tool company service engineer with the tools. Sure it costs a little bit more for that first set of tools—but it pays for itself on the job over and over again. Wesson engineers prove that every day.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 JUDGE ROAD, TORONTO 18, ONTARIO

Cost Cut Twice on Same Job by Wesson In-Plant Engineering

	Original	Step No. 1	Step No. 2
Tool Style	Milled & Brazed	Multicut & Inserts	Multicut & Inserts
Tool Material	HSS & Carbide	Wessonmetal WM & (1) HSS	Wessonmetal WM
RPM	309	309	411
Feed rate, front	.007	.007	.0118
Feed rate, rear	.0036	.0036	.008
Tool cost per 100 pcs.	$7.35	$3.35	$1.75



The manner in which Wesson's in-plant engineering can help reduce tool cost not just once but over and over is illustrated in the table. The job was the turning of forged steering knuckles at a truck plant.

Originally tooling was a combination of high speed and milled-and-brazed single point carbide tools. There was fairly high tool breakage. First switch was to slug-type solid Wessonmetal inserts in Multicut holders with no basic changes.

Overall tool cost however had been more than cut in half. Every tool on the job with one exception showed better life. That one, used for cutting a thread relief previously had had the best life but now, while producing more pieces per grind than formerly, actually was the worst of the lot.

Tool material change didn't help, so the second step was to change the part design to eliminate this tool. A grade change did help however on another tool in the setup used for chamfering the end of the knuckle.

With tool grades set, adjustments in feeds and speeds resulted in further improvement in overall tool life.

Are you using Wesson's in-plant engineering method of cost reduction? Other metal working plants are. They have learned that Wesson's cost-cutting service doesn't stop with the tool order. That's when it really gets going.

"No Grind" Cutter Writes Milling History—*(continued from page 1)*

6. **Smooth Chip Flow**—Shaping of chip gullet gets chips out of the way quickly and smoothly—makes for free cutting.
7. **Minimum Body Wear**—Specially hardened and quick replaceable chip gullets insure long-life cutter body with the very minimum of upkeep.
8. **Rigidity**—The cutters are tops in supporting the carbide blades. Almost the entire back face is supported by husky steel while the wedge bears on half the entire front face.

Here is what truly appears to be tomorrow's general purpose milling cutter. With all cutter grinding eliminated—with eight indexes per blade before you discard it—you can even cut your cutter body inventory.

Litho in U.S.A.



WHY YOU GET BETTER HIGH SPEED INTERNAL GEARS AT MINIMUM COST WITH RED RING NALOY BROACHES

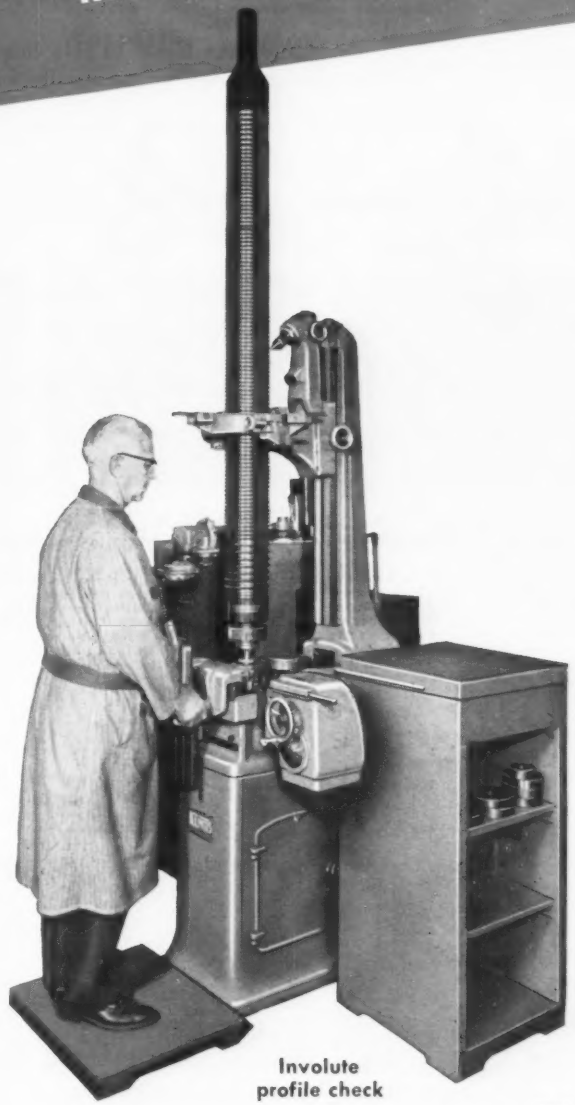
- Gear is completely cut from the solid blank in just one pass. A quick shaving operation or a finish broaching pass completes it.
- Critical gear characteristics held to tolerances of .0002".
- All gears produced are interchangeable regardless of the number of broaching tools in use.

The secret of combining spectacular economy with such high gear precision lies in the broaching tools themselves. Special manufacturing processes are used. Each is under the constant control of Red Ring metallurgists and engineers in this company's own plant.

The real proof of Red Ring methods is reflected in actual performance figures. Ask to see them.



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM



Involute profile check

7680

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

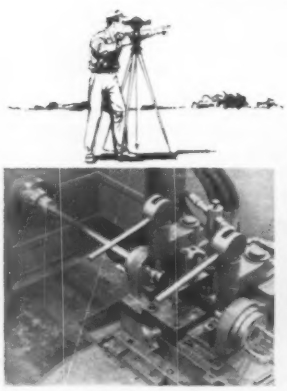
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

TOMORROW'S SUPER-HIGHWAYS

. . . and Heald precision will help speed

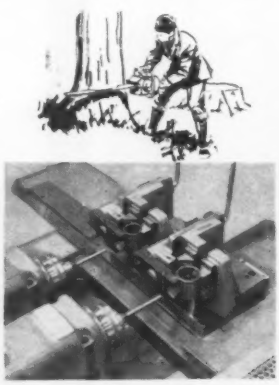
BREAKING the bottleneck of highway congestion, our far-sighted Highway Program will speed motor travel throughout the width and breadth of the entire nation. By 1969 you will be able to drive from coast to coast or between any major points, virtually non-stop.

But where does Heald fit into this picture? Constructionwise, practically everywhere! From start to finish, modern road-building machinery and equipment require a host of precision-parts that can be produced faster, better and more economically on Heald machines — Bore-Matics, Internal Grinders and Rotary Surface Grinders. Entirely apart from the important cost considerations, precision-finishing by Heald can speed production of needed road-building



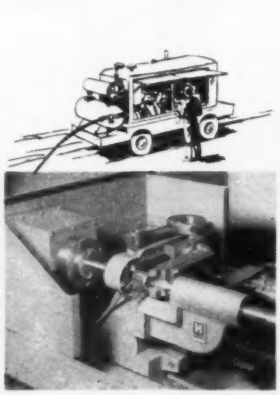
TRANSIT TELESCOPE BODIES precision Borized on two I.D.'s in single, long-bar setup

This Bore-Matic is used to bore two widely-spaced I.D.'s in a long telescope body. The outer end of the long boring bar is supported by a damped tailstock section which engages the bar as the table goes in to bore, preventing deflection and helping eliminate chatter. Machine accommodates eight different parts.



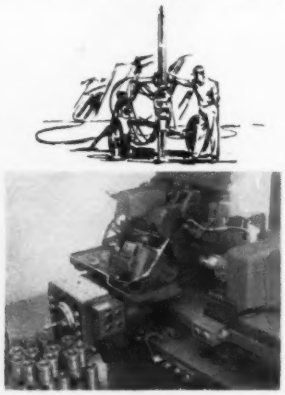
CHAIN SAW PISTONS AND CONN RODS precision Borized on same machine

The Model 221 Bore-Matic shown here does both pistons and conn rods, with easily interchangeable fixtures mounted on aligning rails. In the setup illustrated, pistons are precision bored two-at-a-time. This machine increased production 400% over previous method of doing the same job.



ENGINE CONN RODS FOR PORTABLE COMPRESSORS precision Borized in simple setup at 150 per hour

Heald precision contributes to dependable air power, by Borizing bronze crankpin bushings to a .0003 tolerance for size, and parallel with the bore of the crank end by .004 in 10 inches. Production for this simple setup on a standard Model 121 Bore-Matic is approximately 150 parts per hour at 75% efficiency.



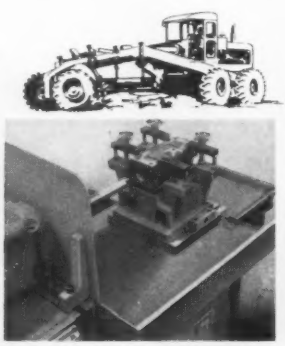
ROCK DRILL VALVE CASES centerless ground on 4 different diameters and 3 faces

This 181 Size-Matic grinds multiple bores in air-drill valve cases, with close tolerances for size, straightness, and concentricity. Four I.D.'s and corresponding bottom faces are ground in sequential runs, changing wheels and table stops only four times to perform all operations on an entire lot of parts.



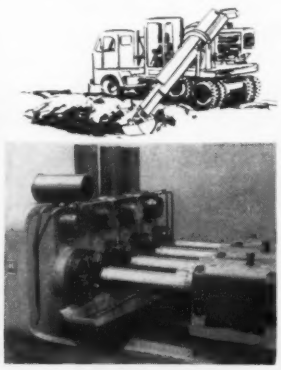
EARTH LOADER DIFFERENTIAL HOUSING bored and faced in fully automatic cycle

This differential housing is precision finished on two in-line bores and front face on a single-end Heald Bore-Matic. Part is hydraulically clamped over locating pins. After boring to a positive stop, cross feed unit automatically performs the facing operation.



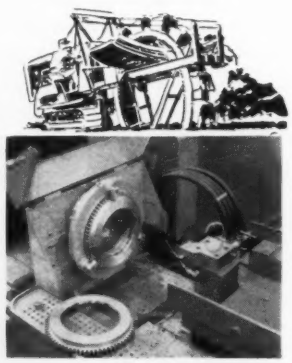
POWER GRADER VALVE BODIES Borized on long, interrupted bore, with damped quill

The bore of scraper control valves must be absolutely straight and free from chatter marks. A Heald Model 221 does the job simply and effectively. The long (9½") bore is finished with a carbide tipped tool held in a damped quill which absorbs self-excited vibration and assures a smooth inner surface.



DIESEL CYLINDER LINERS FOR BOOM-TYPE GRADER bored and chamfered four-at-a-time

This cylinder-liner setup demonstrates the versatility of Bore-Matic design. A four-station hydraulic clamping fixture is mounted on the bridge, and the boring-heads, of special extended design, are mounted on the machine table. Cast iron liners are bored and chamfered, four-at-a-time, to a .001 tolerance.



TRENCHER DIFFERENTIAL CLUTCH GEARS bored, faced and chamfered in single cycle

With this Model 221 Bore-Matic, the work is held in an air-operated rotating fixture, and a hydraulic cross slide carries the boring, chamfering and facing tools. After boring and plunge chamfering, cross slide indexes forward to generate face.

are planned today

construction every step of the way

equipment — and at the same time, add to its useful service life by producing parts with better finish and closer tolerances.

Shown below are just a few typical examples of Heald operations that are improving the performance and dependability of modern highway-type construction equipment from start to finish.

It PAYS to Come to Heald

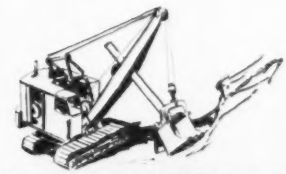
HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

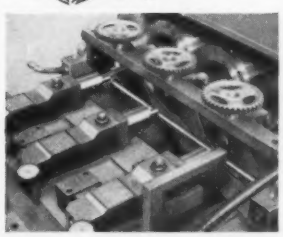
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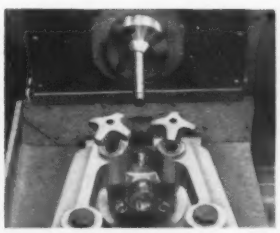






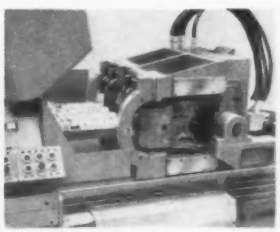
POWER SHOVEL SPROCKETS precision Borized three-at-a-time in trunnion-type fixture

The Model 321 Bore-Matic shown here Borizes cast iron sprockets three-at-a-time with a simple dial bar tooling setup and fast loading, trunnion-type fixture. Three parts are loaded while others are Borizing. Finished parts are automatically ejected and trunnion arm swings new parts into loading position.



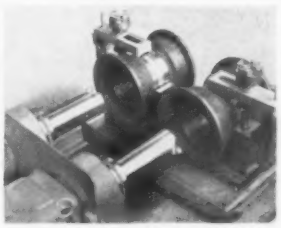
TRUCK STEERING KNUCKLE BUSHINGS Borized simultaneously or sequentially on versatile Bore-Matic

The 221 Bore-Matic shown here Borizes two spaced bushings in truck king pins either simultaneously with a two-tool quill, or in sequence with a single-tool quill boring the front bushing first and jumping at rapid traverse to the rear bushing. Several different sizes are done on the one machine.



EARTH SCOOP DIESEL ENGINE BLOCKS handled easily, Borized accurately

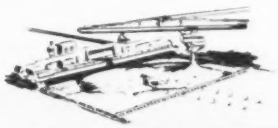
Here, a large, Model 521 Bore-Matic handles big engine blocks with ease. Borizing four cylinder bores simultaneously. Hydraulically operated trunnion-type fixture, shown in Borizing position, swings up 90° for easy loading and unloading from a conveyor line. Machine handles 3 different sizes of blocks.

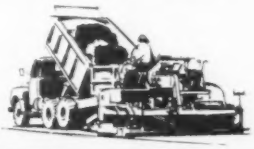


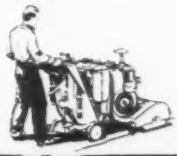
CRAWLER TRACK ROLLERS Borized two at a time on Model 321 Bore-Matic

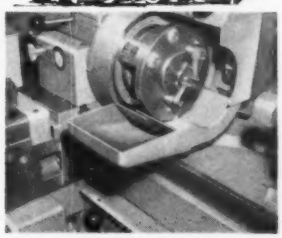
Built to take terrific punishment, crawler track rollers must be precision bored straight, smooth and true. The Model 321 shown here handles these big rollers two-at-a-time. Accurately located and centered in U-shaped blocks, they are hand clamped by two sliding strap clamps on the "U" blocks.





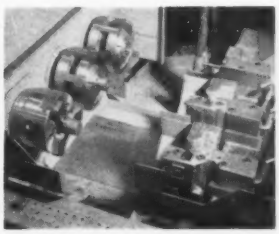






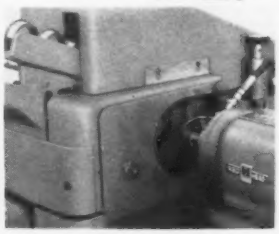
ROLLER CHAIN LINKS FOR ENDLESS LOADER precision ground on Size-Matic Internal

The Model 171 Size-Matic shown here precision grinds the bores of steel roller chain links for endless loaders to a .0005 tolerance for size and .0002 effective pitch parallelism between holes. Link is held in a bore centering fixture with pull-back turn fingers.



GEAR BLANKS FOR CONCRETE SPREADER bored, faced, turned and chamfered

This Model 321 Bore-Matic precision finishes gear blanks on *all surfaces* in three sequential operations. First station drills hole from solid, turns, faces and chamfers. At 2nd station, part is reversed, hole is semi-finish bored and remaining surfaces finished. Hole is finish bored at 3rd station.



ASPHALT SPREADER BEARING RACES precision ground in 30-second centerless cycle

The Heald Model 190 Gage-Matic shoe-type centerless shown here is ideally suited to this type of work. Bearing inner races are chute loaded and all operations are fully automatic. Work is ground to a .0004 tolerance on bore size in a cycle of approximately 30 seconds.



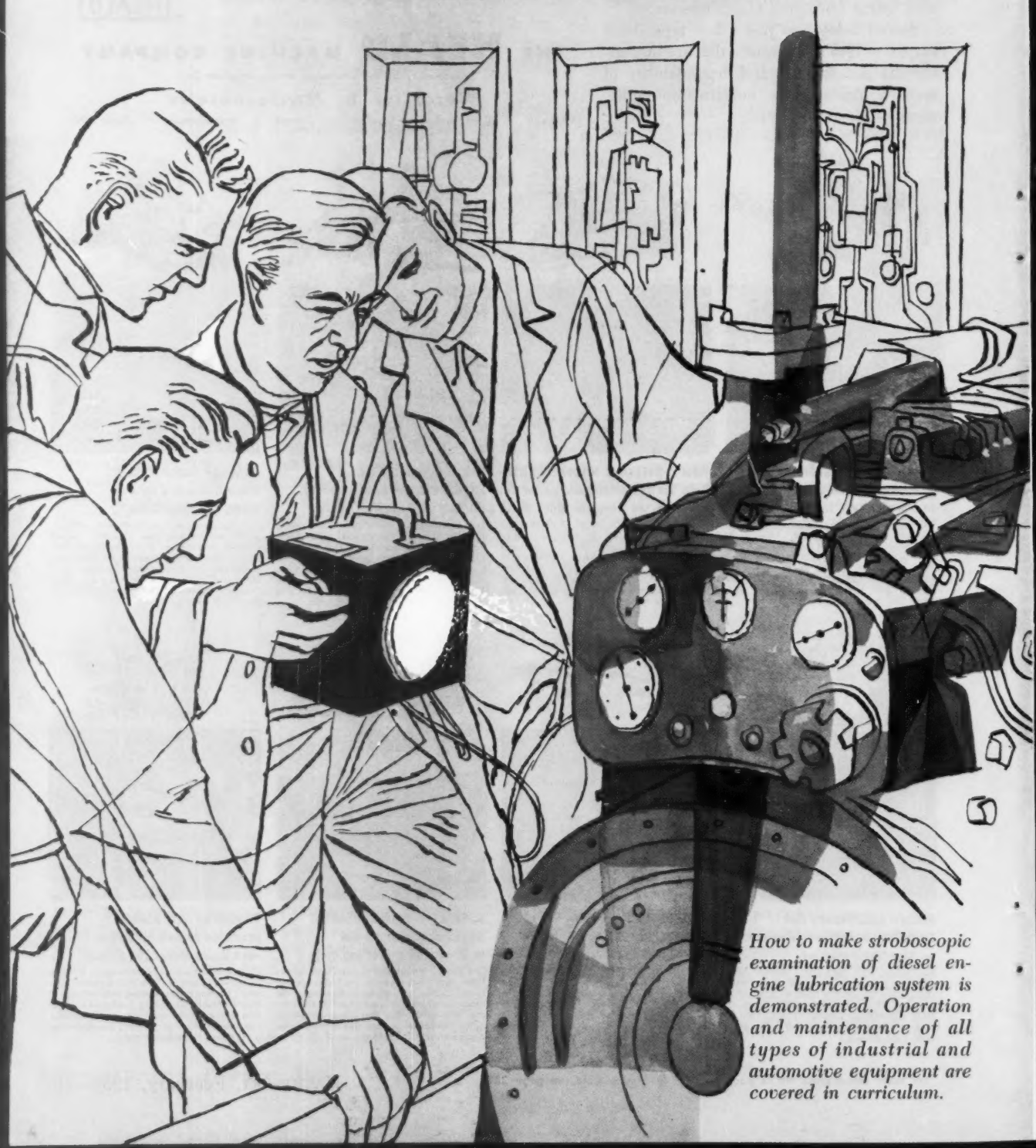
PAVEMENT SAW BLADES precision ground for longer life, on a Heald Model 261 Rotary

Diamond-bonded concrete-saw blades stand up longer on the job because the steel blanks are precision ground on a Heald Model 261 Rotary Surface Grinder. Saw blade blanks are held on a magnetic chuck and both sides ground parallel with a very smooth surface finish.

For more information fill in page number on Inquiry Card, on page 239

How does an oil company
prepare men for
industrial technical service work?

Here's how Standard Oil



How to make stroboscopic examination of diesel engine lubrication system is demonstrated. Operation and maintenance of all types of industrial and automotive equipment are covered in curriculum.

trains its men

At the Standard Oil training center on Chicago's south side—not far from the Company's refinery and research laboratory at Whiting, Indiana—men who have demonstrated an aptitude for such work are given a 17 week course in industrial lubrication, equipment maintenance and metal working. And thus begins the training Standard Oil gives its men who are to provide technical service to customers.

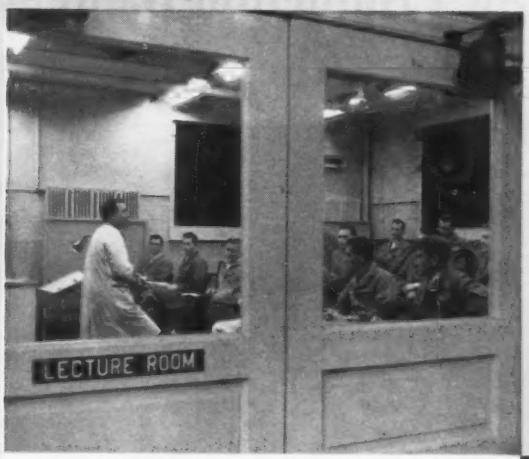
Most men selected for this Sales Engineering School have college degrees in some engineering or scientific field. And in most cases these men, prior to attending the school, have had field experience in technical service work to start them off with an appreciation of the problems industry meets in lubricating equipment and working with metal.

This course for lubrication specialists and engineers includes lectures and work in chemical laboratory, engine laboratory and machine shop. Senior Standard Oil men, recognized authorities on lubrication and metal working, are the instructors. Other Standard Oilers with teaching skills and years of field experience, direct the shop work and supervise the school's laboratories.

Class, shop and lab work are augmented by field trips to plants where "students" learn first-hand more about the lubrication problems confronting industrial customers.

The Standard Oil Sales Engineering School has graduated 15 of these classes. The many men who have completed the course are now serving customers out of Standard's 23 offices in fifteen Midwest and Rocky Mountain states. Would you like one of these men to call on you? Then telephone your nearby Standard Oil office. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

Lectures, shop and lab work comprise training course.



STANDARD

STANDARD OIL COMPANY
(Indiana)

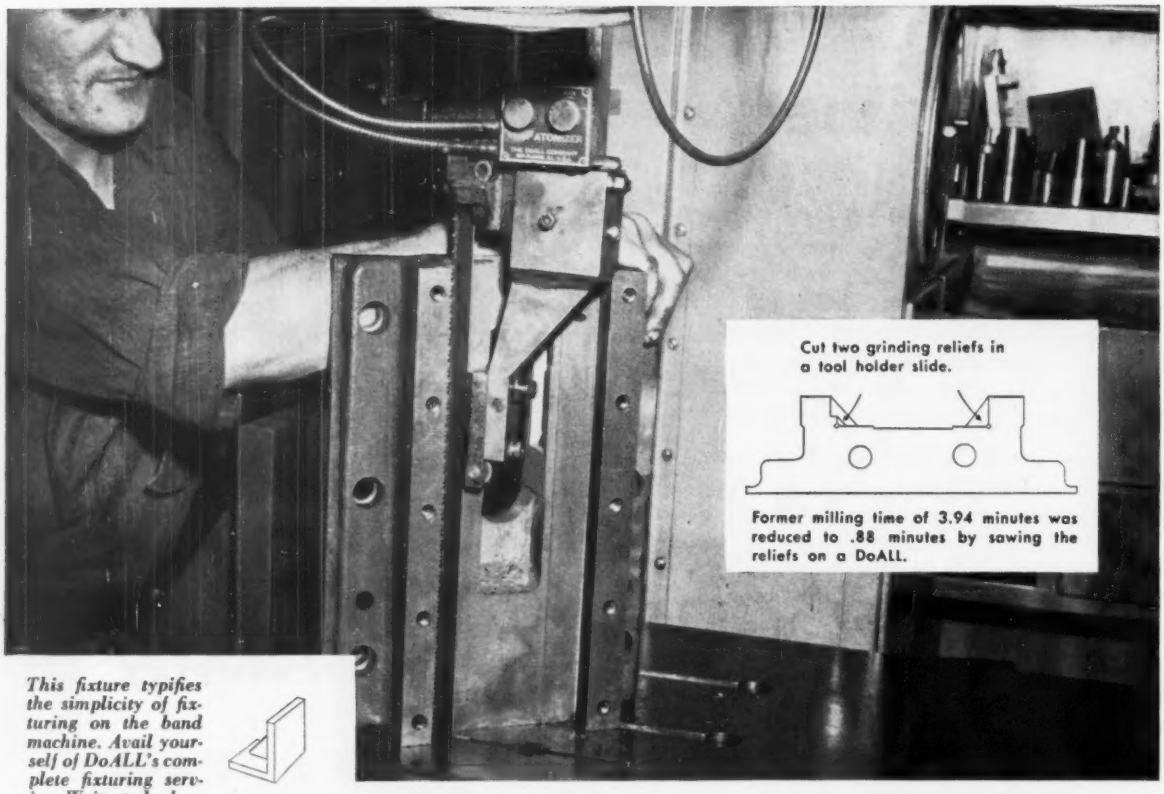


Testing and comparing bearing lubrication methods.



Kinematic viscosimeter is used to test viscosity of lube oil. C. S. Brown (right) learns to run test. Brown, like many classmates, has science degree.

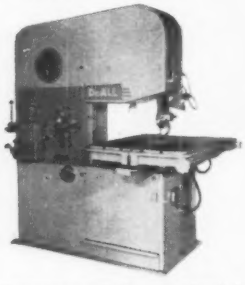
How Production Band Machining Reduces the Cost of Cutting Grinding Reliefs



Cut two grinding reliefs in a tool holder slide.

Former milling time of 3.94 minutes was reduced to .88 minutes by sawing the reliefs on a DoALL.

This fixture typifies the simplicity of fixturing on the band machine. Avail yourself of DoALL's complete fixturing service. Write today!



This Contour-matic is a standard design machine modified by DoALL to provide extra work height capacity required for this job. DoALL can fit your requirements, too.

Manufacturer Does Job in ¼ the Former Time . . .

In search for new cost cutting methods, one manufacturer found that major savings could be made in machining grinding reliefs, simply by switching the job to a DoALL Contour-matic band machine.

Results: Reliefs that formerly took 3.94 minutes on a milling machine were produced in 1.33 minutes on a DoALL Contour-matic with a carbon steel saw band. Changing to the new Demon H.S.S. saw band, the time was further cut to .88 minutes, for a time saving of 78% over the former milling time. One operator now does in one hour what formerly took 4 hours!

Reasons: The continuous cutting slender saw band penetrates the metal much faster than possible with other methods. Too, the cutting force is directed downward only, thus eliminating costly hold-down fixtures and lengthy set-up time . . . only a simple back-up bar is needed.

Cutting grinding reliefs is just one of the many production machining operations that can be done faster at lower cost with a DoALL. For information and a free, in-your-plant demonstration of this new, basic production tool, see your local DoALL Sales-Service Store or write:

THE DoALL COMPANY, Des Plaines, Illinois



The Demon H.S.S. saw band developed by DoALL is the world's fastest cutting, longest lasting saw band.

DoALL

FREE LITERATURE AND MOVIES—Ask for the new 16-page band tool catalog and Contour-matic catalogs. See in sound and color, "Production Band Machining" (30 minutes) and "Production Tooling" (10 minutes)—both available for group showings.



Friendly DoALL Sales-Service Stores in 38 cities. Call yours today!





P8-31

For more information fill in page number on Inquiry Card, on page 239

THE MONARCH RIGHT ANGLE IS YOUR BEST ANGLE

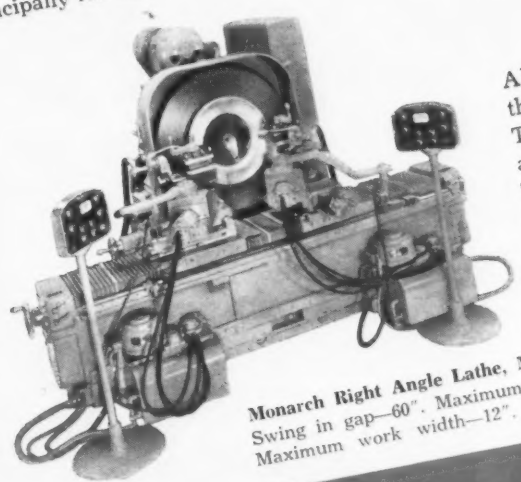
. . . for the turning, boring, and facing of thin-walled work pieces having large diameter and short length.

Here's a specialized chucking machine for optimum output—for every plant producing this type of work in sufficient volume.

For instance: large metal gaskets—large refrigerator compressor discs—miscellaneous disc and ring work—specialized mold work—tire rings and mold shells for tire manufacturers—large diameter housings. And, of course, jet engine components such as discs, wheels, rings, spacers, vane assemblies, shrouds, and so on.



Specifically, you get such Monarch specialties as Air-Gage Tracer controls, completely automatic turning cycle with push button control, power angular feed, in-built constant surface cutting speed on the Model F (principally for facing), and dual slides on the Model O (principally for turning and boring).



Monarch Right Angle Lathe, Model O.
Swing in gap—60". Maximum turn diameter—48". Maximum work width—12". Motor size—20 H.P.

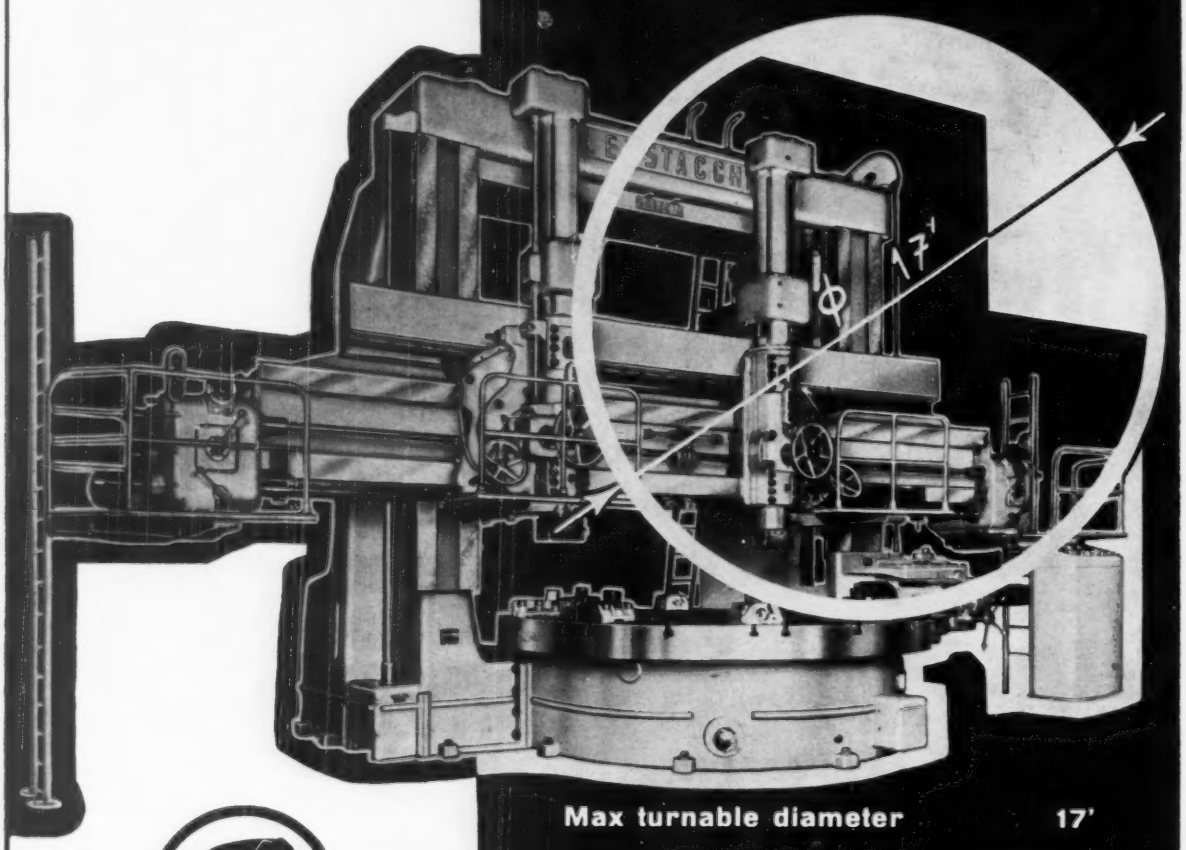
All the features and uses of this machine would fill a book. They do, and we have it. Just ask for Booklet #1401 . . . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER...TURN TO MONARCH

Heavy duty machine tools for mechanical, electromechanical siderurgical and metallurgical industries, for shipyards, arsenals and railway shops.

DOUBLE COLUMN VERTICAL BORING AND TURNING MILL



Max turnable diameter	17'
Power	HP 135
Admitted weight	Tons 55
Total weight	Tons 160

SE

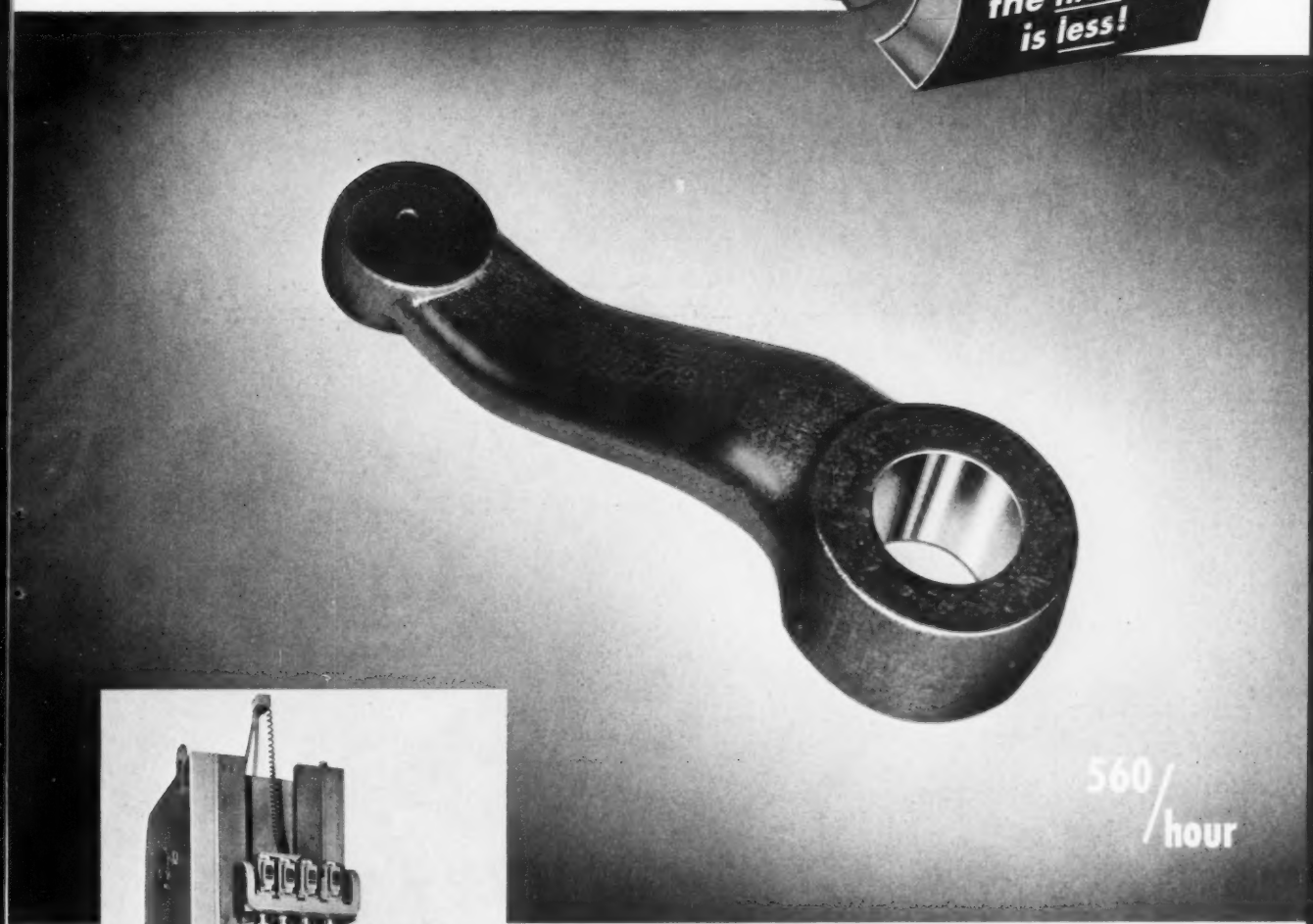
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S. EUSTACCHIO

BRESCIA (ITALY)

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WITH COLONIALS the final cost is less!





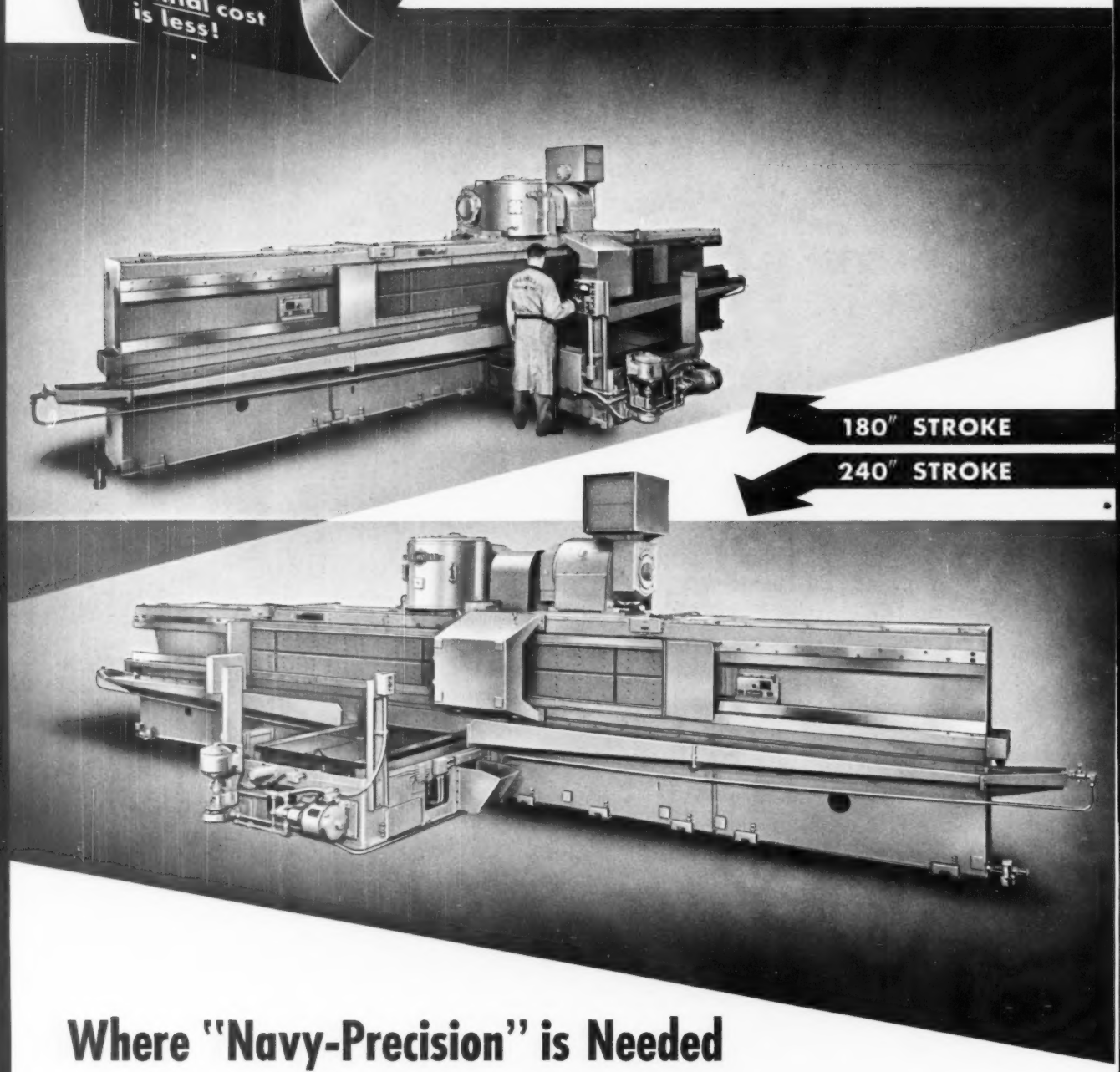
This is a typical UNIFIED BROACHING installation engineered and built by **COLONIAL** *with automatic index and unloading to give the lowest cost per piece produced. The machine is a 15-ton, 66-inch stroke* **COLONIAL**, *covered in our Bulletin RU-54. We'll be happy to send you a copy.*

Broached at 100% Capacity Without Automation

One of those versatile **COLONIAL** installations that can be used so many different ways. This manufacturer needed that many parts an hour of just one part. You might want only 140 parts an hour of four different parts. Can be done just as well in such a set-up. You can find cost saving profit-boosting ideas like this in every issue of BROACHING NEWS. If you are not getting it, drop us a line on your company letterhead and we'll gladly put you on the mailing list.

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

WITH COLONIALS the final cost is less!



Where "Navy-Precision" is Needed COLONIALS like these get the Call

Here are two of COLONIALS line of big ElectroGear drive horizontals, a 180-inch and a 240-inch stroke precision-broaching model being readied for delivery to Navy and Air Force contractors. COLONIAL produces both sizes in either 15 or 25 ton capacity. Both are available with ram face widths of 18 or 24 inches and either box type or V-type ways. Phenolic-lined ways available for high accuracy requirements.

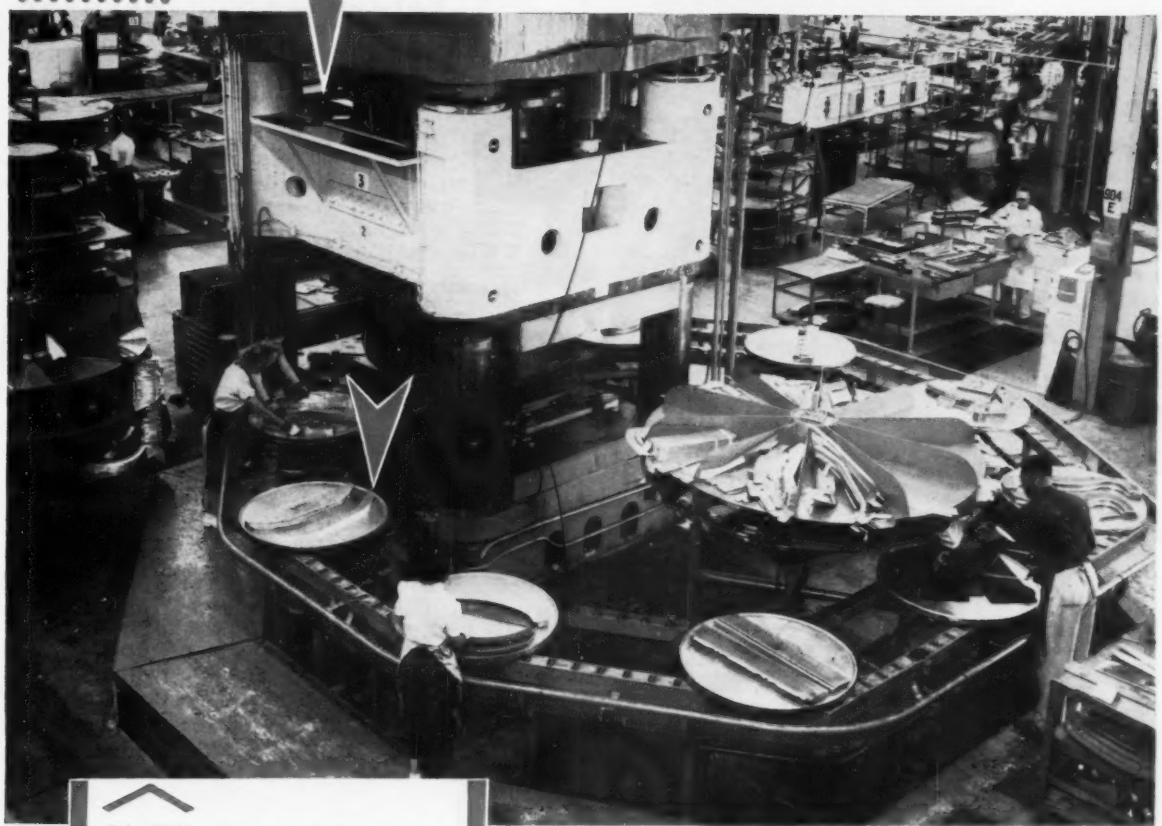
They come with trunnion or horizontal shuttle tables; plus a vertical shuttle slide for 2-pass broaching.

Broaching speeds are up to 300 ft. per minute. For more details ask for a copy of Bulletin HM-56.

COLONIAL BROACH & MACHINE CO.
DETROIT 13, MICH.

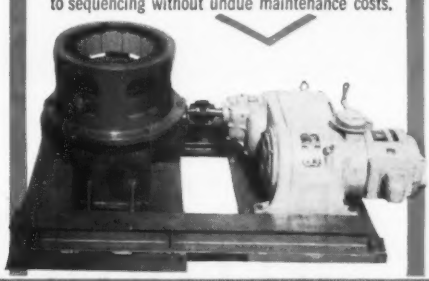
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FAWICK-EQUIPPED "MERRY-GO-ROUND" TRIPLES PRODUCTION OF PRECISION AIRCRAFT PARTS



This 4500-ton hydro-press produces a variety of aircraft parts at the Los Angeles plant of North American Aviation, Inc. Synchronized with the press is a "merry-go-round" shuttle table, equipped with Fawick Clutch and Brake, which tripled the efficiency of the operation. The shuttle transfers platens from standby to forming position in 5 seconds—complete cycle takes 19 seconds. Labor has been cut 50% and a former safety hazard has been 80% eliminated.

DRIVE UNIT uses Fawick Clutch and Brake because of smooth starts and stops and adaptability to sequencing without undue maintenance costs.



Smooth starting and stopping . . . instant response to controls . . . low maintenance cost—these are the reasons why North American Aviation, Inc., selected a FAWICK Airflex Clutch and Brake for the drive unit of their own design "merry-go-round" shuttle table. This new device has tripled production of precision aircraft parts from a 4500-ton hydro-press.

This is another example of the outstanding performance of FAWICK Products in many industries. For more information on how FAWICK can improve the performance of your machines, call or write your nearest FAWICK Representative or the Home Office today.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
In Canada: Fawick Canada, Ltd., Toronto, Montreal

FAWICK Airflex
INDUSTRIAL CLUTCHES AND BRAKES

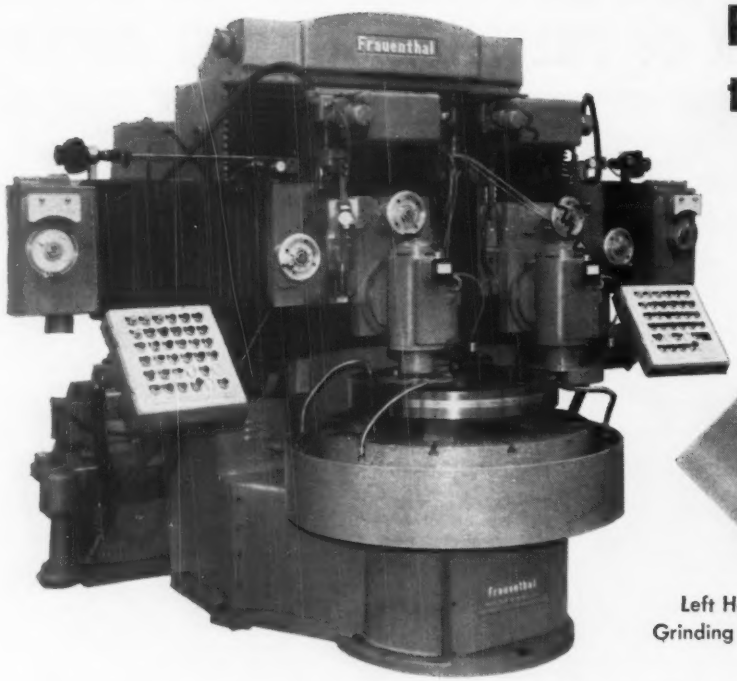
Field Offices and Representatives in principal cities

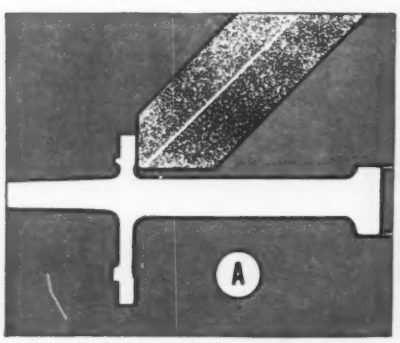
For more information fill in page number on Inquiry Card, on page 239

tho in U.S.A.

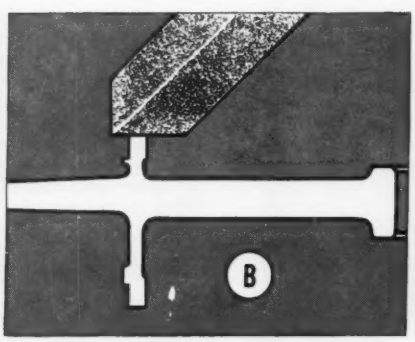
Multiple Grinding Operations

Frauenthal 1800 Series tolerances . . . assures

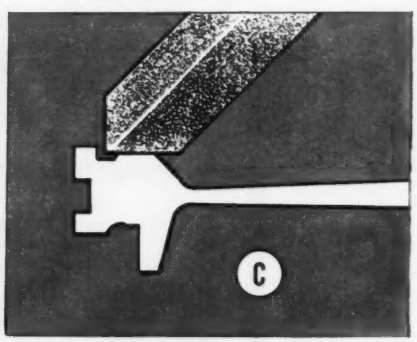




Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.



Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand



grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

Frauenthal Division

in One Set-Up

Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

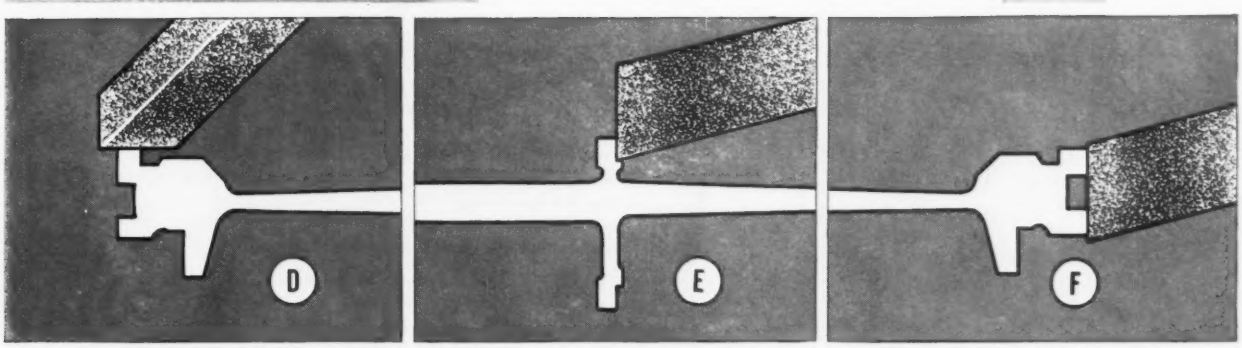
With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.



Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.



Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN

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Chief of Engineers say:

"Heap big saving on die cost with

T-J CUTTERS!"



Smoke out facts—plain to see that Chief makes sense! T-J Cutters plenty rugged. Raise um feed. Reduce um die cost. Follow trail of many tribes—use T-J for tough die sinking milling. Chief knows you will like! Sign treaty now for T-J Cutters. Good medicine for high production, lower costs!

Yes, T-J makes the kind of he-man Cutters you need. Designed for speed, accuracy and long life . . . less breakage . . . more work between grinds! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes. Send smoke signal or write for new catalog No. 1055. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

PARKER • MAJESTIC PM PRECISION MACHINES

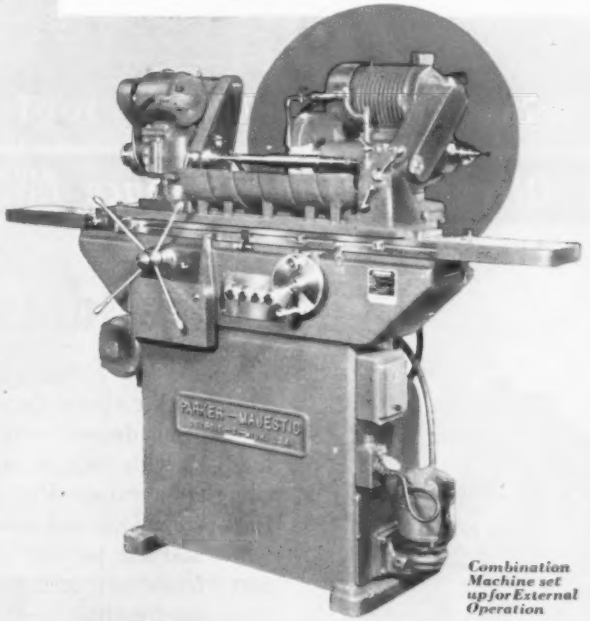
NOW A COMBINATION INTERNAL/EXTERNAL GRINDER



Combination Machine set up for Internal Operation

PARKER-MAJESTIC *presents the well known Internal and External Grinder shown here as a combination unit.*

- One spindle mounting bracket performs both operations.
- Quick changeover—Loosen only four nuts and swivel bracket 180° to bring spindle into operating position.
- 12″ swing over table.



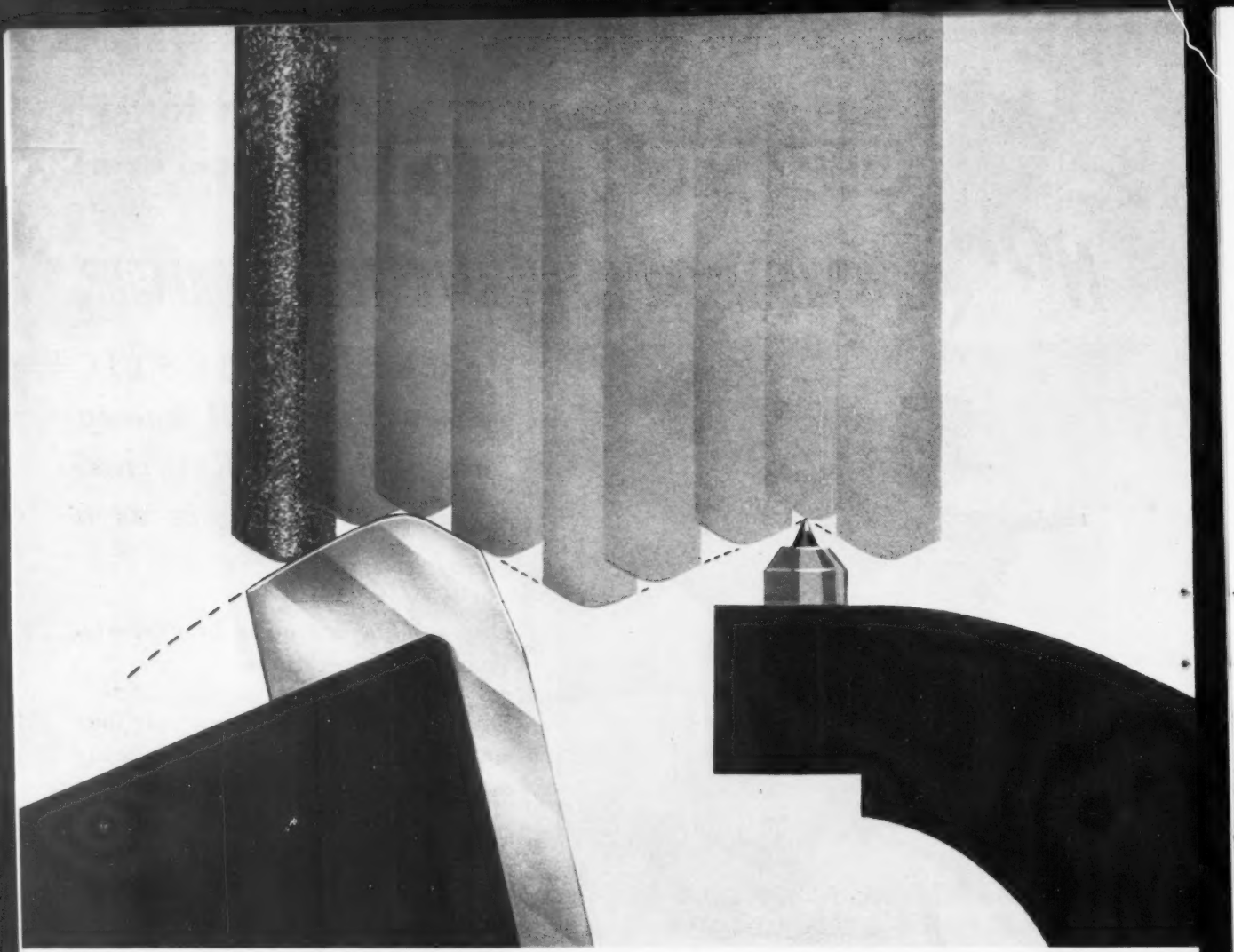
Combination Machine set up for External Operation

- Horsepower rating maintained in new totally enclosed motor design; drive pulleys mounted on either end of motor.
- Internal spindle driven by flat belt in conjunction with spring loaded idler assembly of new design.
- External spindle driven by timing belt requiring little belt tension.
- Operator protected by well designed guards.

PARKER-MAJESTIC, INC.

147 Joseph Campau • Detroit 7, Michigan

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Oliver AUTOMATIC Face Mill Grinder

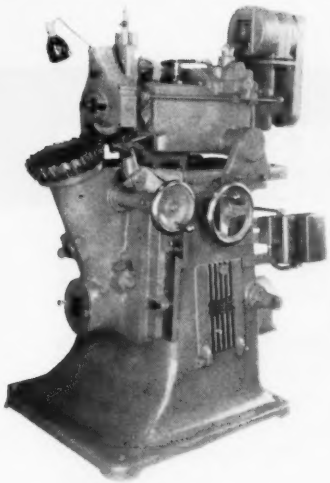
Wheel dressed with every stroke



Oliver face mill grinders are made in four sizes to accommodate cutters from 4" to 21" diameter.

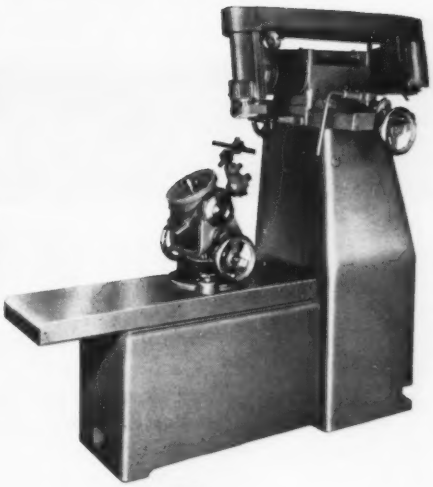
The drawing above shows the grinding wheel passing over a cutter tooth after being dressed and formed automatically by a fixed diamond. This happens with each stroke of the Oliver automatic face mill grinder. Thus, complete accuracy of grind is certain regardless of the number of teeth in the cutter. This exclusive Oliver of Adrian feature prevents loading of the wheel and also permits carbide grinding with a silicon carbide wheel. Automatic feed-down accurately compensates for each dressing thus providing a fixed grinding line.

The machine automatically indexes the cutter and controls the tooth shape by a simple cam arrangement so that any practical roughing or finishing form can be obtained. The machine grinds the corner angle, corner radius, face and dish all in one operation. Oliver's face mill grinder is hydraulically operated for smooth, fast (4 to 8 times faster per cutter), accurate and quiet performance.



OLIVER *Automatic*
FACE MILL GRINDER

. . . features real economy and fast, accurate grinding. One operator handles several machines. Set-up is simple. The cutter is mounted on the face plate and the automatic indexing mechanism adjusted. Required clearance is set by moving the work spindle to the desired position. All surfaces and radii are ground in one continuous operation.



OLIVER *General Purpose*
FACE MILL GRINDER

. . . heavy duty; for all types of face mill grinding on coarse and fine pitch cutters from 4″ to 24″ in diameter. All angles and clearances are instantly obtained without calculation. The cutter face, periphery and corner angles may be ground without altering the lip rest setting. The machine is completely universal.



OLIVER *Arc Radius*
GRINDER

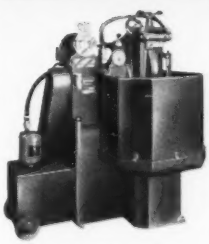
. . . for accurate sharpening of face mills, channel cutters, slotting cutters, etc. The face, periphery and corner radius are ground with one pass of the wheel; radius blended in perfectly. The machine will sharpen any radius up to two inches. Periphery clearance may be greater than the face. If desired, the machine will give a straight grind. High speed, diamond wheels may be used.

More **OLIVER** of **ADRIAN** *Tool Grinding Equipment*



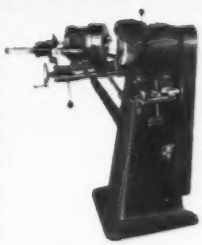
ACE TOOL and CUTTER GRINDER

Universal—grinds milling cutters, other cutting tools. Especially suited to grinding tungsten carbide.



TEMPLATE TOOL BIT GRINDER

Controlled form grinding for high speed, stellite and tungsten carbide single point tools.



No. 510 DRILL POINTER

Semi-automatic. For drills ¼″ to 3″ in diameter. No. 21 bench models available for size ½″ and smaller.



DRILL POINT THINNER

For low cost reclaiming of drills. Corrects off-center and too-thick webs and out-of-index cutting edges.



DIE MAKING MACHINE

Produces dies, gages, cams, templates, stripper plates, etc. at greatly reduced costs. 5 designs in 2 types.

Just check the coupon for literature on the OLIVER of ADRIAN machine you are interested in. Send it today to . . .

OLIVER of ADRIAN
OLIVER INSTRUMENT COMPANY
1410 E. Maumee St. • Adrian, Michigan

- ☐ Drill Pointer
- ☐ Face Mill Grinder
- ☐ "Ace" Universal Tool and Cutter Grinder
- ☐ Die Making Machine
- ☐ Drill Point Thinner
- ☐ Template Tool Bit Grinder

NAME_____

COMPANY_____

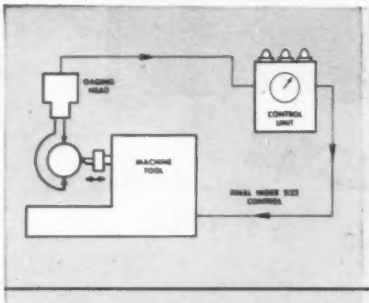
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CITY_____ ZONE_____ STATE_____

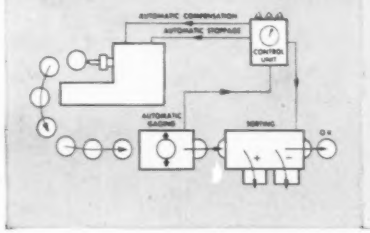
Why FEDERAL offers more

RELIABILITY THRU DIVERSIFIED EXPERIENCE

Diversity in Automatic Control



IN-PROCESS
control utilizes gage to make tool retract when part has been machined exactly to correct size.

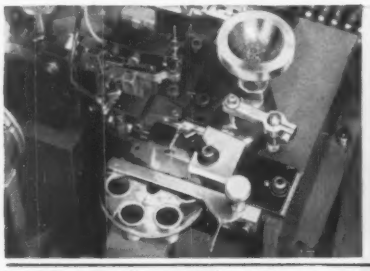


POST-PROCESS
control provides feedback of corrective signals from automatic gage to machine to maintain part uniformity. Federal pioneered both this and "In-Process" type of control.

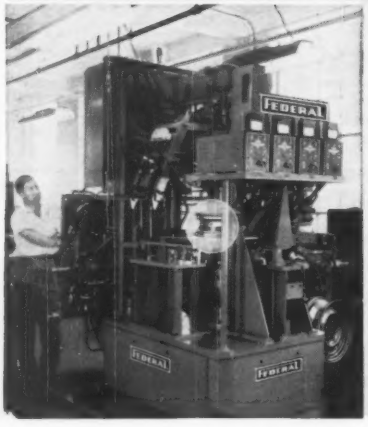
Any type of precision gage should be reliable, but when the gage becomes part of the automated process, reliability becomes of premium importance. There's a lot at stake. Over the years Federal has developed numerous ways to greatly increase Automation Gaging reliability. For instance . . . using extremely low voltage at sensitive switching contacts. This eliminates pitting, and tremendously prolongs contact life, maintains precision. And, Federal Automatic Gages employ electronic switching . . . vastly more accurate, faster, and more maintenance-free than the use of mechanical means to actuate work-handling relays.

You don't come by these features overnight. They are the result of hard-headed experience acquired in the designing and building of many diversified types of automatic gages. This extra reliability is bound to pay off. It's reliability which you not only can afford, but which *you cannot afford to do without.* And, only Federal provides it!

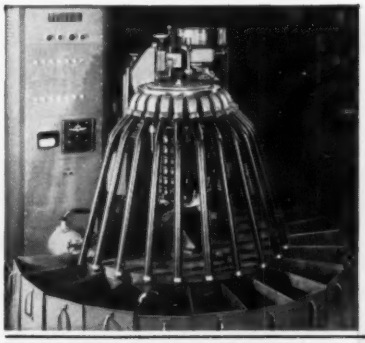
Diversity in Automatic Inspection



WATCH JEWELS
Each jewel is the size of a pin-head, yet this gage automatically handles, checks and sorts 1800 per hour! Gage measures hole in jewel only .008" in diameter.



TRUCK WHEELS
This Federal Gage automatically checks 500 massive truck wheels an hour for radial and lateral runout, sorts into good and bad.



24,000 PIECES PER HOUR
This high speed automatic gage checks diameter of various size ball bearings, sorts into 12 categories of .000010" each!



21 DIMENSIONS
2400 per hour. This gage is adjustable to automatically handle 13 sizes of turbine blades, measuring almost two dozen dimensions in only 4 stations.

in Automation Gaging!

SIMPLICITY THRU STANDARDIZATION



UNITIZED CONSTRUCTION
Critical elements are specially constructed for quick replaceability.

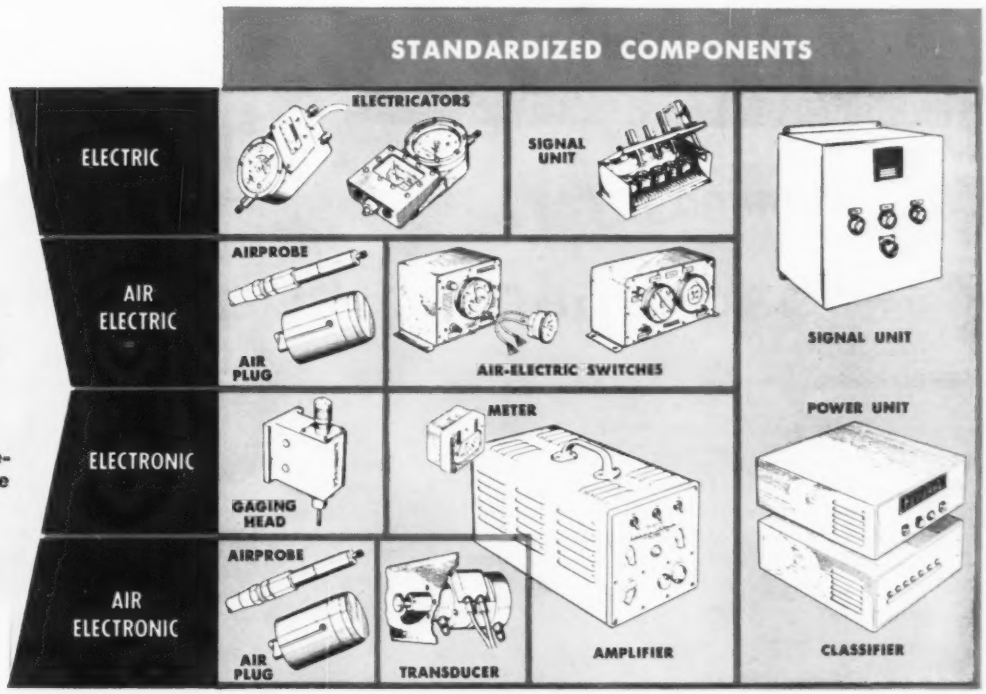
Automation will never become wholly standardized, but Federal — because it has had such long-time experience in this field — is able to meet most control and inspection demands using basic, standardized components. This means lower costs for you, for one thing . . . but much more importantly . . . it means greater reliability of performance. It means this too — much less dependence on technical talent and immediate service. Standardized units can be replaced with spares quickly and easily, should the need arise. What sizable savings in downtime costs!

This is the kind of common sense design you should have in return for your Automation Gaging investment . . . and Federal can give it to you. Ask your nearest Federal representative to come in and discuss this in terms of your own needs.

FEDERAL PRODUCTS CORPORATION
7112 EDDY STREET • PROVIDENCE 1, R. I.

4 SYSTEMS OF GAGING

Only **Federal provides this flexibility to meet gaging requirements more economically.**

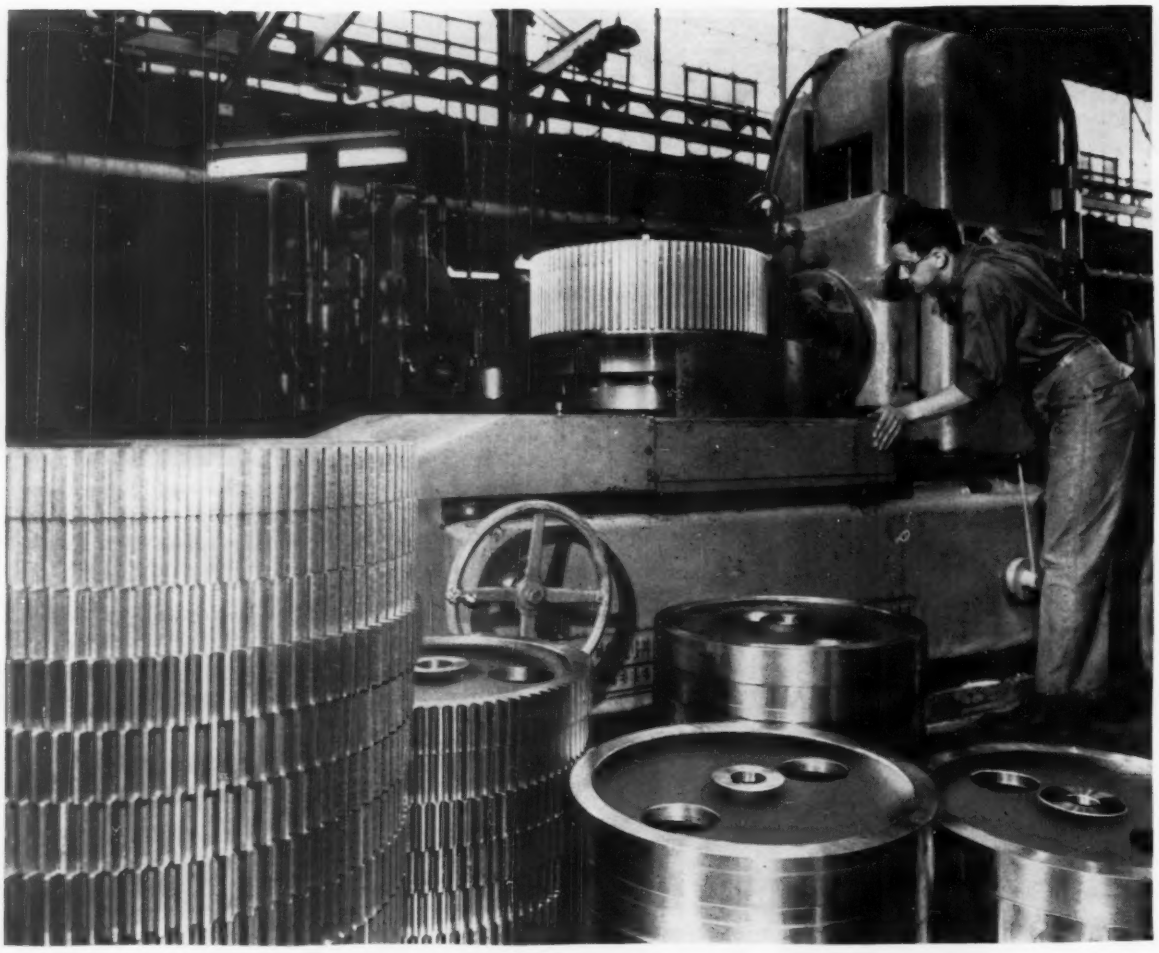


Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

For more information fill in page number on Inquiry Card, on page 239



Extra Stamina for

Road Building Equipment

The illustration shows one of the many operations that are performed in our plant on gears for power cranes and similar types of equipment.

This is not an ordinary run-of-the-mill job. The material is a Bethlehem blank, forged and rolled by a unique single-step method that provides great strength, uniform density and desirable grain flow. These gears are precision machined and hobbed and have the teeth flame hardened.

The result—a substantial increase in strength and resistance to wear.

We are equipped to produce . . . Spur Gears . . . Helical Gears . . . Worms and Worm Gears . . . Sprockets . . . Ratchets . . . Splined Shafts . . . Racks . . . Segment Gears . . . Feed and Adjusting Screws . . . to your specifications. Send your inquiries and prints to The Adams Company, 1942 Market St., Dubuque, Iowa.

The ADAMS Company
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

FINE GEARS MADE TO
YOUR SPECIFICATIONS

GEARS

For more information fill in page number on Inquiry Card, on page 239

12 spindle speeds, instantly selected with direct-reading, color match dial.

All-geared spindle drive transmission.

Totally enclosed quick change gear box. 48 or 54 thread-feed changes.

Ground and flame hardened bedways insure years of accurate service.

Hardened steel gears in all 3 transmissions assure long-life operation.

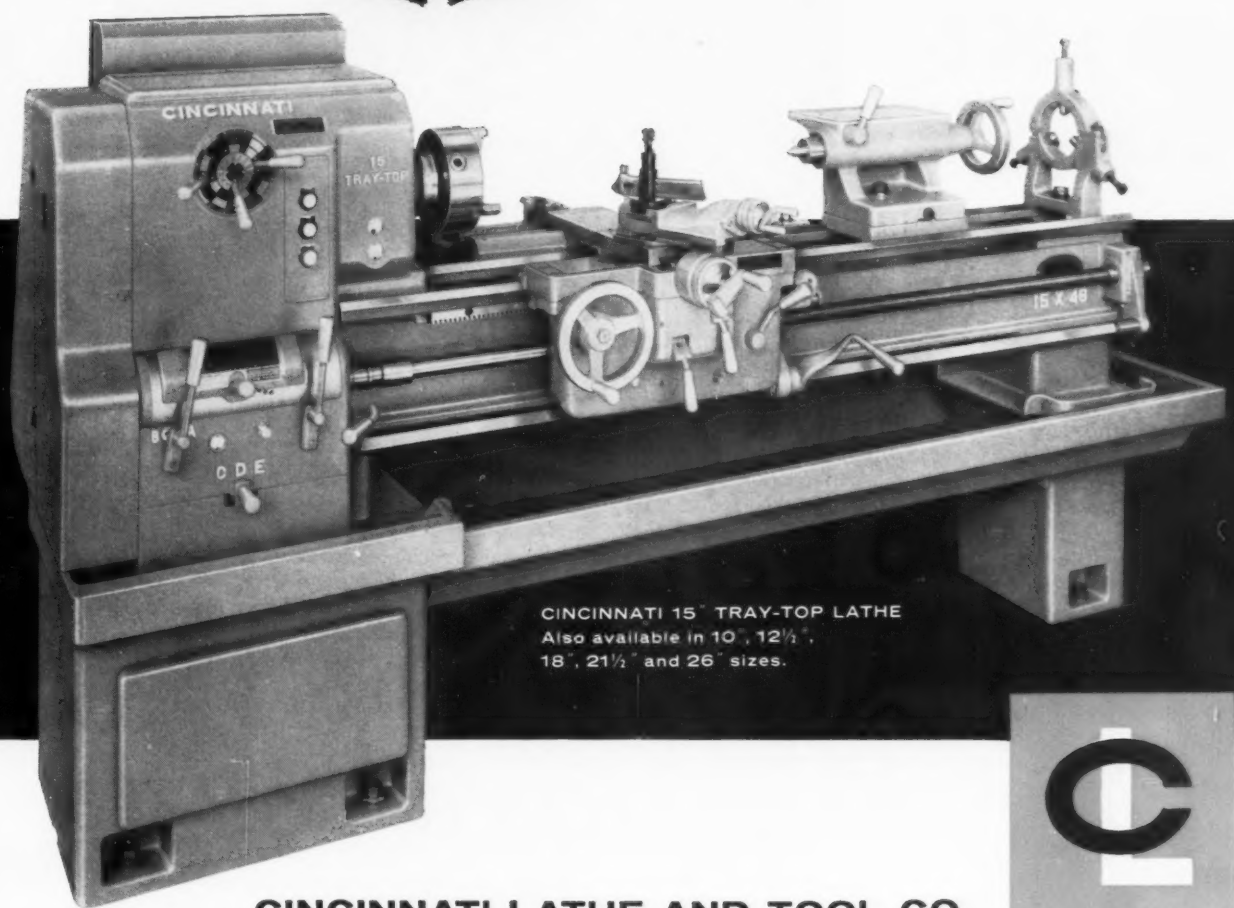
Fully enclosed electrical controls increase operating ease and safety.

Tray-Top Lathes give you many other features normally found only on larger, more expensive lathes. For all the facts and features, see your Cincinnati dealer. Send today for catalog data.

Because it's a

CINCINNATI
TRAY-TOP LATHE

more goes into it...
you get more out of it!



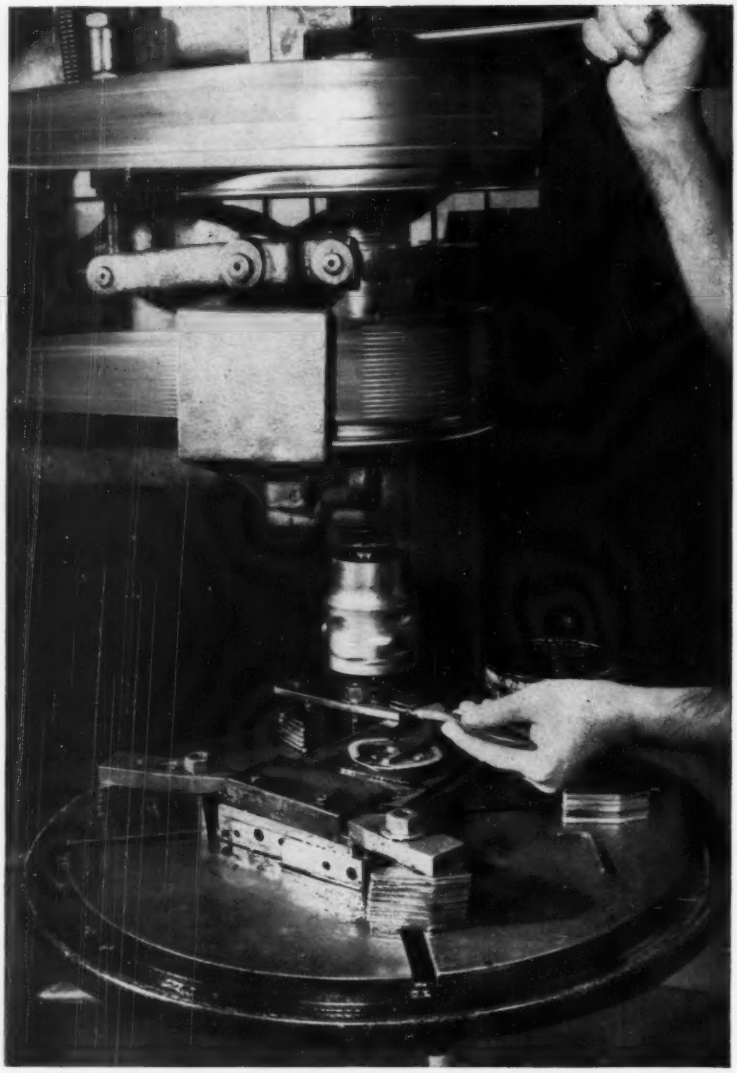
CINCINNATI 15" TRAY-TOP LATHE
Also available in 10", 12½", 18", 21½" and 26" sizes.

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street, Cincinnati 9, Ohio

Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a Complete Line of Drilling Machines

"INCREASED TAP LIFE FROM 250 TO 4000 PIECES"



Cities Service Chillo Cutting Oil produces astounding results for C.S.S. Machine & Tool Company, Philadelphia, Pa.

Metal stamping . . . precision grinding . . . machining . . . stud welding . . . tool and die making. These are some of the expert operations performed by the 120 skilled employees of C.S.S. Machine & Tool Company of Philadelphia . . . operations based on many years' knowhow and teamwork. And for the past year, with Cities Service cutting fluids, this work has been done with even greater precision, greater efficiency than ever before.

In its tapping operation, for example, C.S.S. increased tap life from an average 250 pieces to over 4000 pieces with Cities Service Chillo Cutting Oil. And in a drilling operation with its Brown and Sharpe Automatics, time required to make one piece was cut from 240 to 165 seconds!

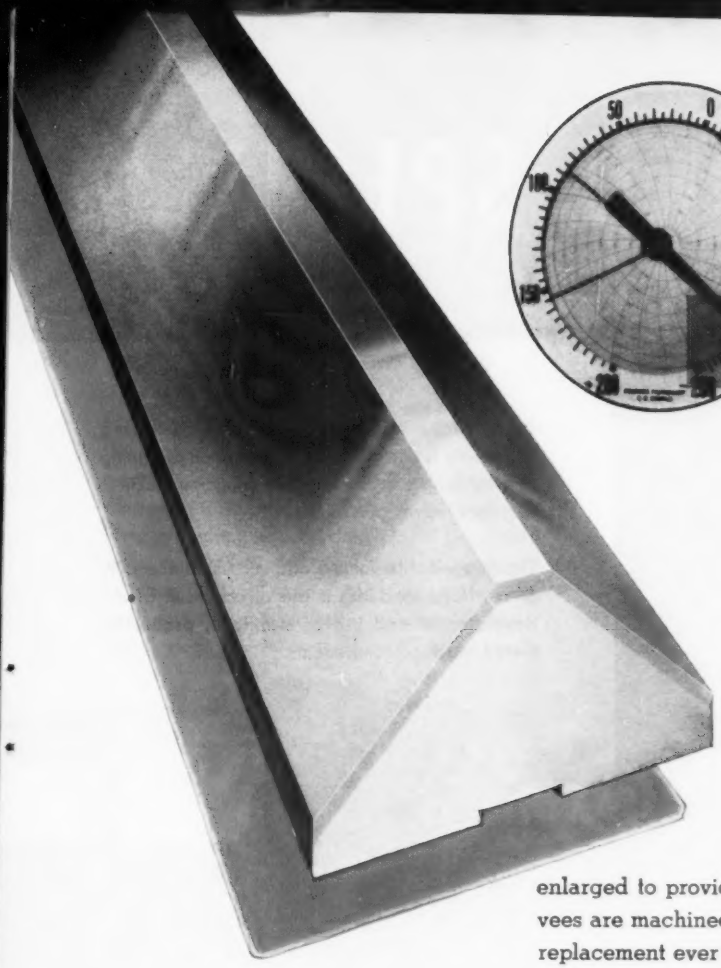
Says President F. G. Schutz: "Cities Service Chillo Cutting Oils are the best we've ever seen. Likewise, Cities Service Lubrication Engineers. It's wonderful to deal with someone who knows our operation so well and has products that help improve it."

If you have a lubrication problem, or even if you're running smoothly, talk with a Cities Service Lubrication Engineer. He's known for solving problems, known for making smooth operations still smoother. Or, if you prefer, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

For more information fill in page number on Inquiry Card, on page 239



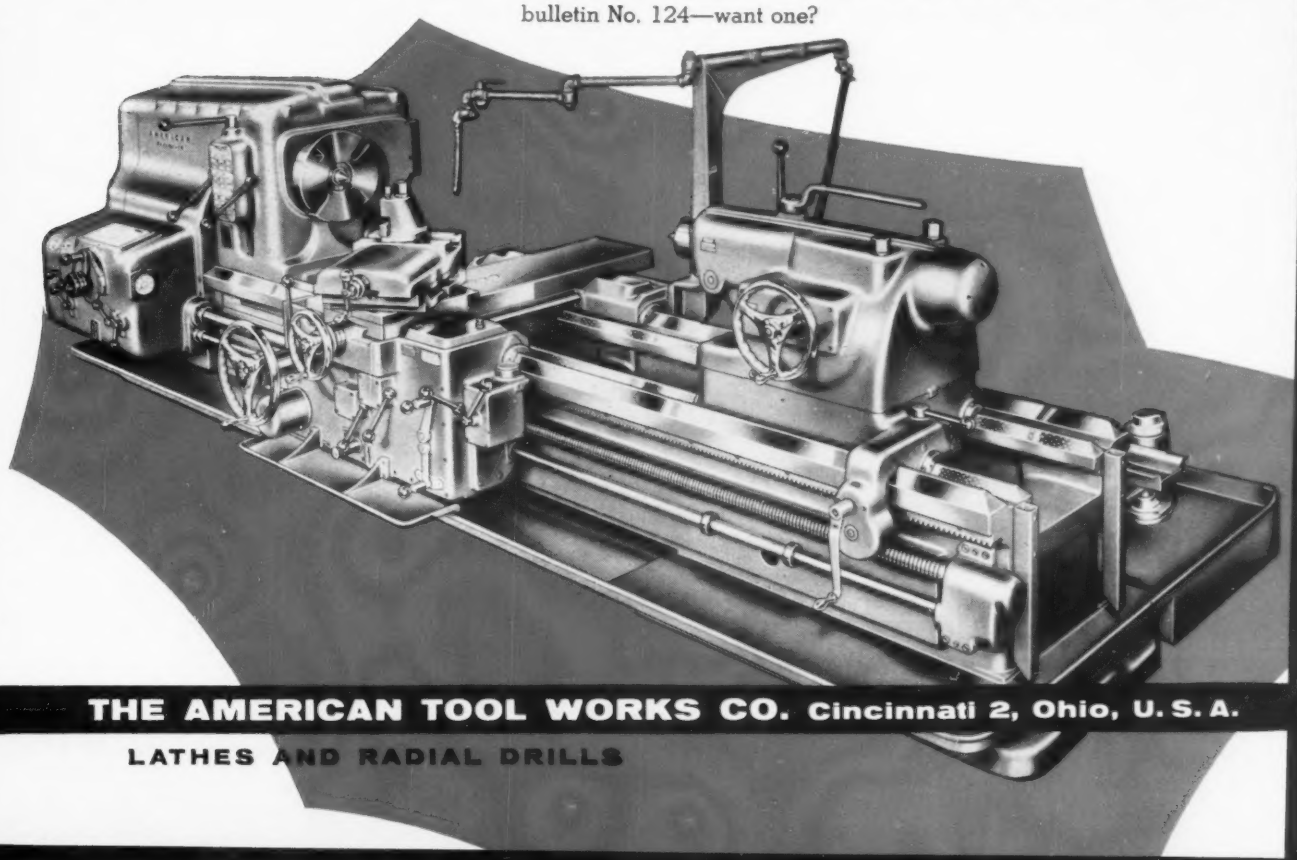
150° BELOW

After hardening to 62 Rockwell C the solid tool steel "AMERICAN" Pacemaker bed vees are stabilized in the deep freeze at 150 degrees below zero.

This freezing treatment not only raises the surface hardness but thoroughly stabilizes the metallurgical structure and prevents twisting or warping.

On the new DeLuxe Model "AMERICAN" Pacemaker the bed vees have been enlarged to provide extra large bearing area for the carriage. The vees are machined to gauge tolerances for interchangeability should replacement ever be required.

This is but one of the outstanding advantages offered by the new DeLuxe Model Pacemaker. Others are illustrated and described by bulletin No. 124—want one?



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

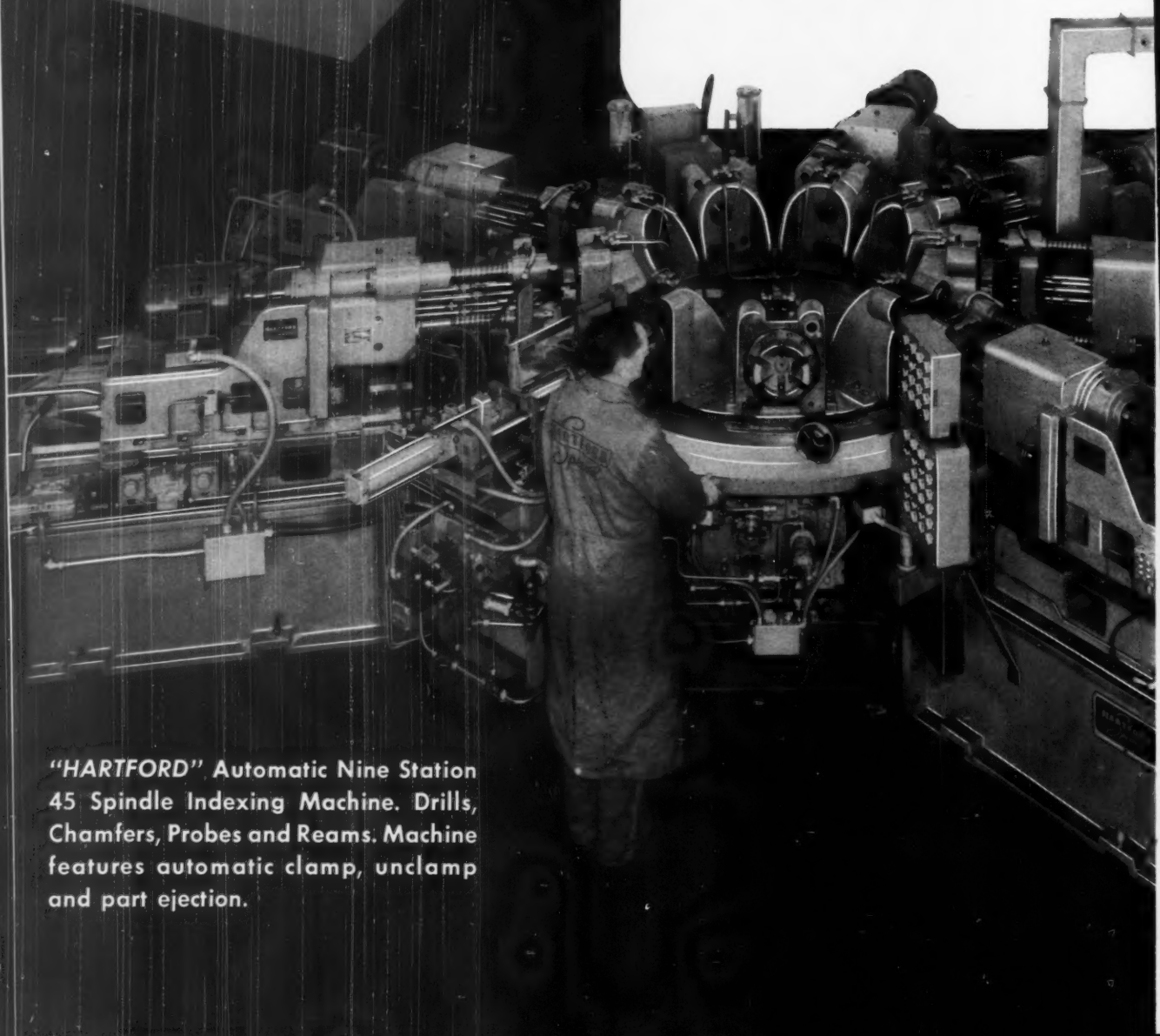
LATHES AND RADIAL DRILLS

"HARTFORD SPECIAL"

COMPLETELY TOOLED MACHINES ready to produce on your floor

Automatic production and parts processing machinery is our business. 45 years of designing and building experience go into every machine tool that leaves our plant.

The dependable volume and consistent economy of Hartford machines is the direct result of our development and use of standard, production tested machine components.



"HARTFORD" Automatic Nine Station 45 Spindle Indexing Machine. Drills, Chamfers, Probes and Reams. Machine features automatic clamp, unclamp and part ejection.

AUTOMATIC EQUIPMENT

For plants with long-run high production jobs the answer is Hartford's automated production machines . . . for plants requiring diversified short-run production, the answer is Hartford's complete range of "building blocks", standard machine components which can be assembled on your floor to fit the job. Consult Hartford engineers for both — better products at lower cost through better methods will be the result.

STANDARD MACHINE COMPONENTS

ready for assembly into production machines on your floor



QUILL TYPE AIR HYDRAULIC DRILL UNITS





QUILL TYPE LEAD SCREW TAPPING UNITS



QUILL TYPE CAM UNITS



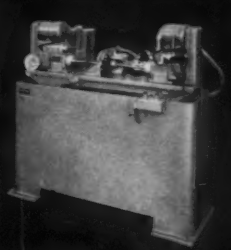
MACHINE BASES



WAY TYPE HYDRAULIC FEED UNITS



AUTOMATIC INDEX TABLES



"Hartford" double end drilling machine assembled completely from standard components — Drill Units Base and Cabinet.

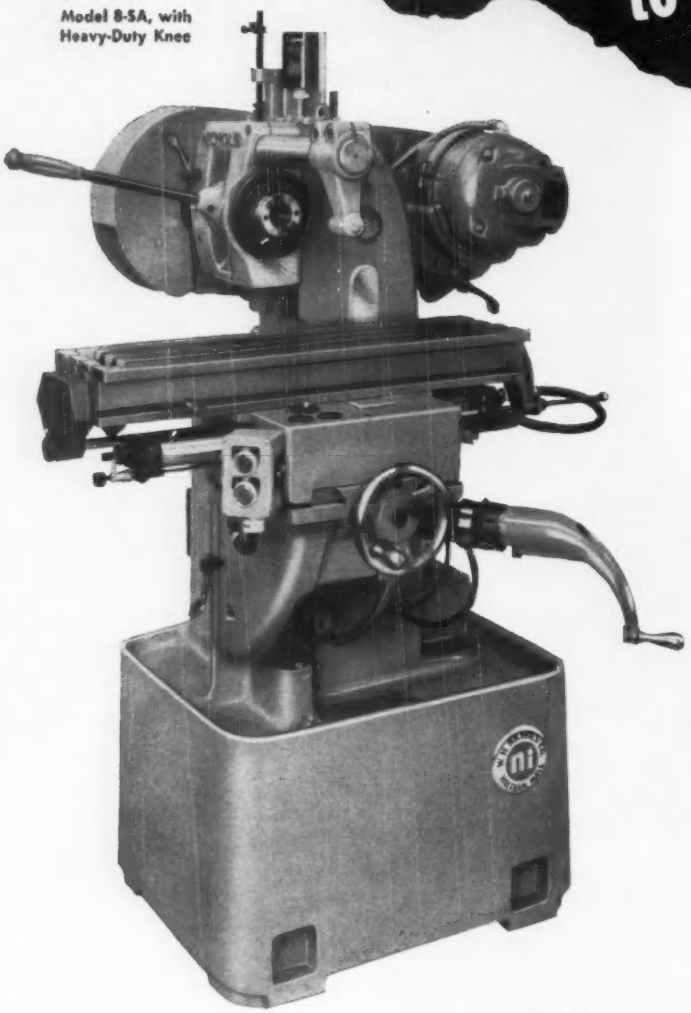
"HARTFORD" ALSO BUILDS AUTOMATIC THREAD ROLLING MACHINES AND THE WORLD FAMOUS SUPER-SPACER

HARTFORD *Special*

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
2902 HOMESTEAD AVE., HARTFORD 12, CONN.

For High Production to "Tenths"

Model 8-SA, with Heavy-Duty Knee



MODELS

	6-SA	8-SA
Table Working Surface	6¾" x 21"	8½" x 30"
Total Table Stroke	9"	14"
Total Cutting Stroke	5¾"	14"
Transverse Travel	7"	6"
Vertical Travel—Knee	13½"	11"
Rise and Fall of Spindle	4½"	4½"

Selective Speed Ranges up to 5000 R.P.M.

It's the SEMI-AUTOMATIC NICHOLS MILLER

"The Versatile Miller That Uses Its Head"

Nichols Semi-Automatic Millers are equipped with "easy to set up" air-hydraulic table cycles providing rapid approach, variable cutting feed, and rapid return. The operator merely loads and unloads.

In addition to the automatic table feed, the Rise and Fall Spindle head and the Cross Feed may be so equipped. It adds up to a flexible combination of synchronized automatic motions which make Nichols ideal basic millers for modern production lines.

Available in two models—the 8-SA with Heavy Duty Knee and Saddle to support 8½" x 30" table having 14" stroke . . . and the 6-SA with Standard Duty Knee supporting 6¾" x 21" table having 9" stroke.

The Nichols SEMI-AUTOMATIC, and all Nichols Millers, provide unequaled accuracy that SAVES CUTTER COSTS and BOOSTS PRODUCTION.

•

Write today for general catalog. A sound, color movie, "The Miller that Uses its Head" is available for free showing. May we reserve it for you?

MANUFACTURED BY W. H. NICHOLS COMPANY

NATIONAL DISTRIBUTORS THE ROBERT E. MORRIS COMPANY

5002 FARMINGTON AVENUE • WEST HARTFORD 7, CONN.



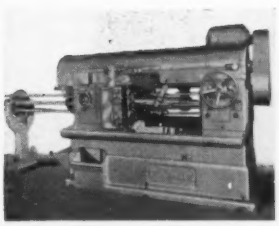


First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

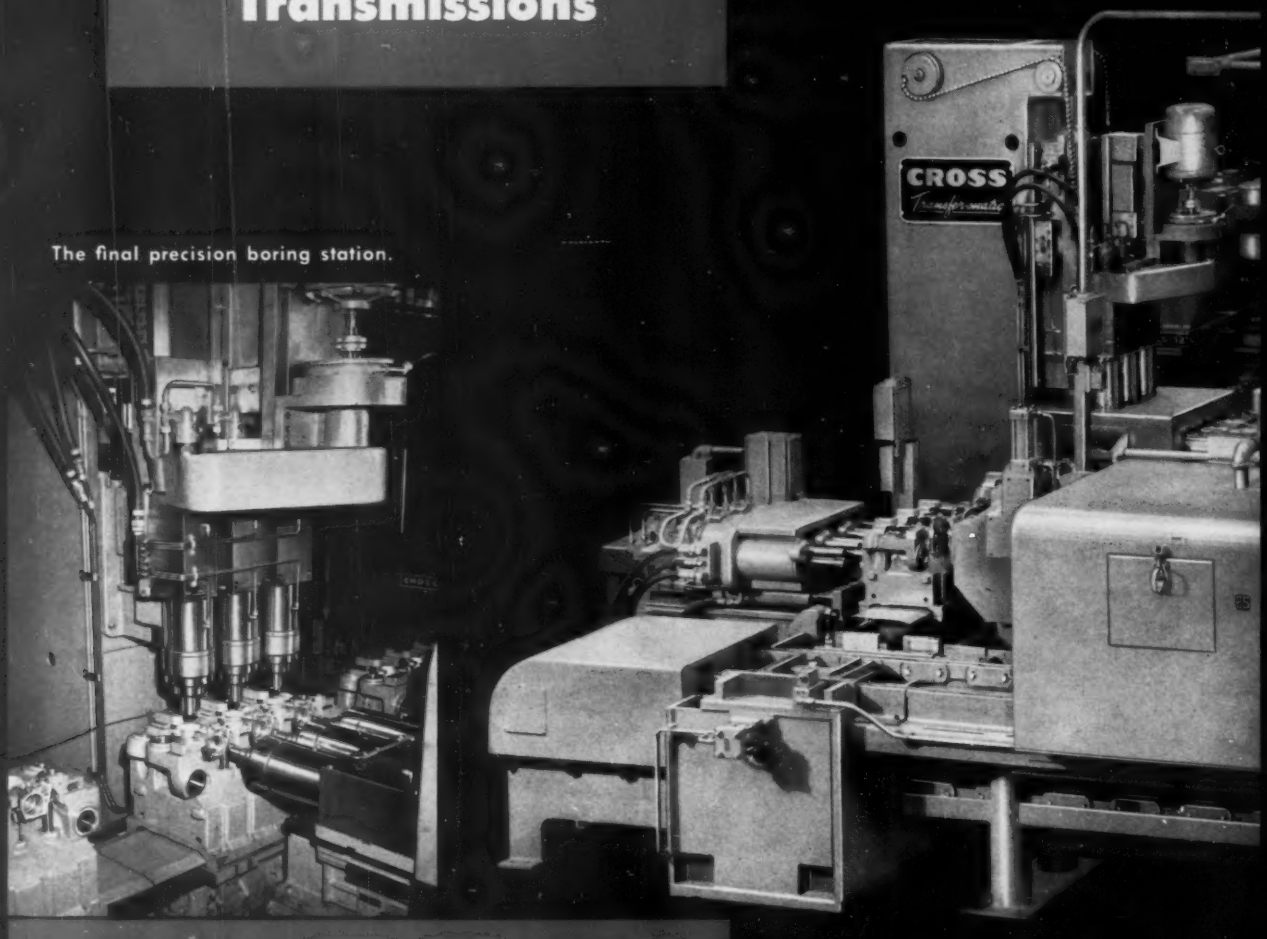
A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.



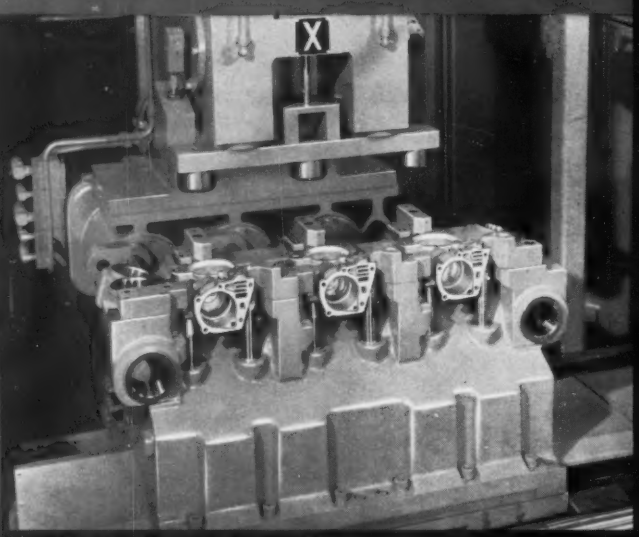
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

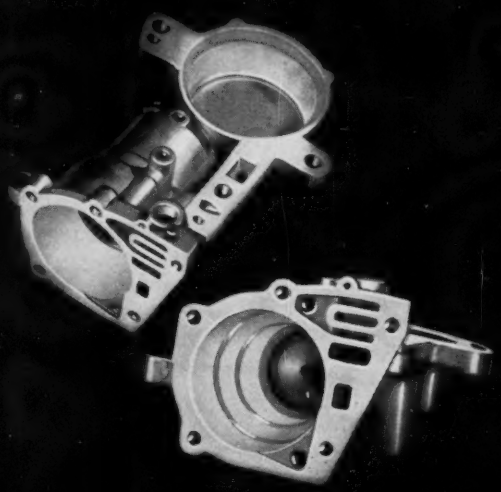
Completely Machines Servo Valve Bodies for Automatic Transmissions



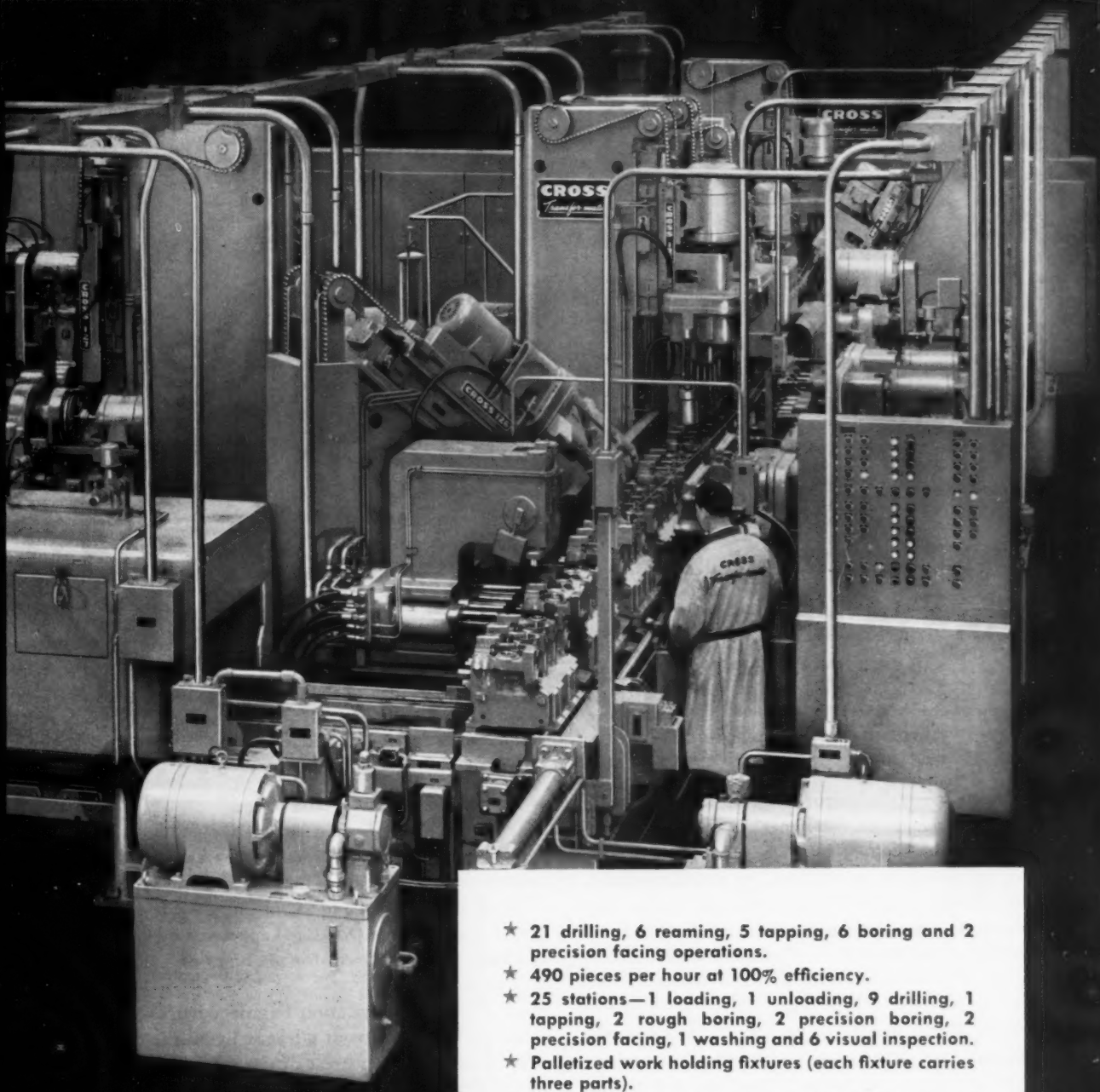
The final precision boring station.



The loading station. Part locations are checked automatically by Unit X to assure proper clamping.



Another Transfer-matic by Cross



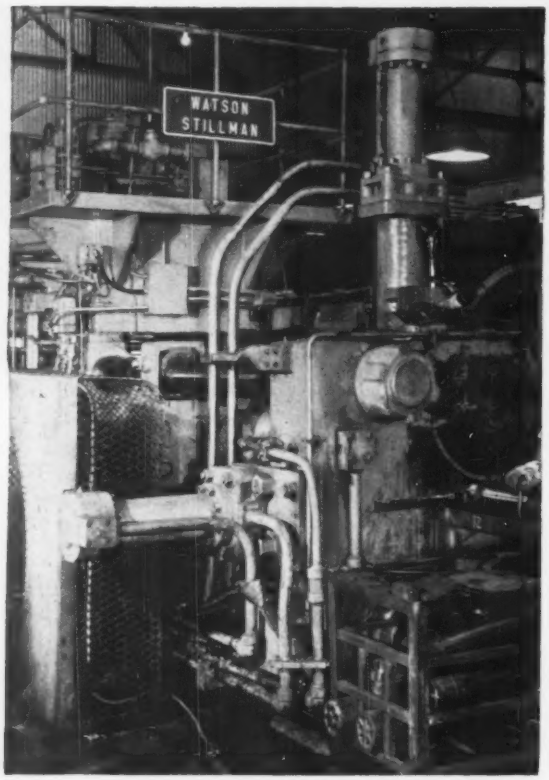
- ★ 21 drilling, 6 reaming, 5 tapping, 6 boring and 2 precision facing operations.
- ★ 490 pieces per hour at 100% efficiency.
- ★ 25 stations—1 loading, 1 unloading, 9 drilling, 1 tapping, 2 rough boring, 2 precision boring, 2 precision facing, 1 washing and 6 visual inspection.
- ★ Palletized work holding fixtures (each fixture carries three parts).
- ★ Unloading unit for removing parts from fixtures and placing them on conveyor.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ "Building Block" construction to provide flexibility for design changes.
- ★ Other features: automatic washing unit for fixtures; construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.

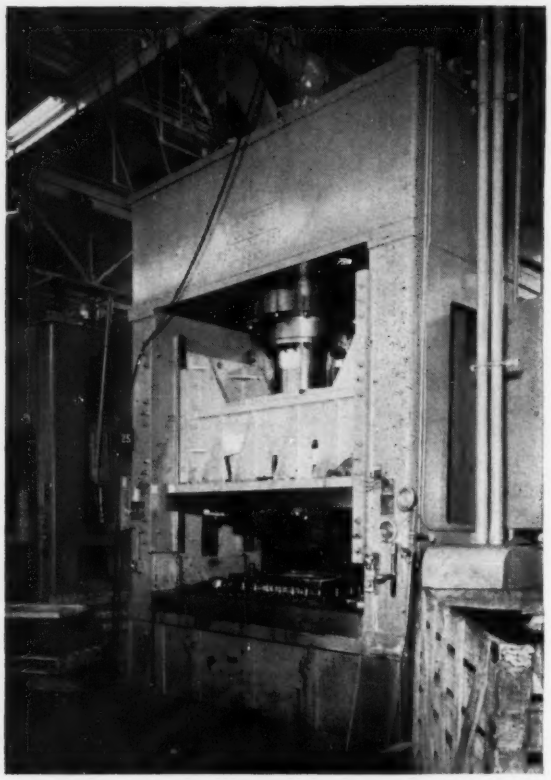
Established 1898

THE **CROSS** CO.

First in Automation

DETROIT 7, MICHIGAN





How to assure NO SLUDGE, NO RUST, NO FOAM in hydraulic systems

Here are two case histories of *Texaco Regal Oil R&O* and how it keeps sludge, rust and foam out of hydraulic systems. Names and details on request.

1. Even when the extrusion press (left, above) is on 24-hour schedules, the owner reports, operation is perfect with *Texaco Regal Oil R&O*. **"No stoppages, no delays in production, no trouble whatsoever. Periodic checks show the oil to be in excellent condition, without a trace of sludge. The entire system stays clean, free from rust and foam."**

2. After five years of operating the 500-ton press (right, above) on the original charge of *Texaco Regal Oil R&O*, the owner reported: **"In spite of the severe service we give it, the press has never had to be down for repairs and the hydraulic system has been completely free of sludge, rust and foam . . . the *Texaco Regal Oil R&O* as clear as that out of a new sealed drum."**

Tests prove that *Texaco Regal Oil R&O has more than ten times the oxidation resistance* of ordinary turbine-quality hydraulic oils — and far superior ability to prevent rust and foam. There is a complete line of *Texaco Regal Oils R&O* approved by leading hydraulic manufacturers for all types of hydraulic equipment.

Let a Texaco Lubrication Engineer help you get better performance from all your hydraulic equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO **TEXACO** CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN . . . METROPOLITAN OPERA RADIO BROADCASTS EVERY SATURDAY AFTERNOON

For more information fill in page number on Inquiry Card, on page 239

- Look Ahead
- Look Back
- Look Up
- Washington Briefs



Keeping up with Washington

By Loring F. Overman

IN Washington's year-end symposium, conducted by the United States Chamber of Commerce to review 1956 and preview 1957, machinery was assigned an enviable spot. "Whichever way the cookie crumbles," according to the experts, indications are that machinery will fare exceedingly well in the years ahead. If the future brings inflation, the added cost of equipment and machinery can be brushed aside as deductible business expense. If recession, industrial buyers can be expected to take advantage of a season of arrested prices. If war—hot or cold—machinery will be needed for defense. If peace, the trend toward automation will speed the demand for replacement of machinery which might otherwise remain in production lines for many years.

Look Ahead

"Post-war industrial construction has not yet fully run its course," observed symposium-panelist Edwin Barringer, executive vice-president, Institute of Scrap Iron and Steel, Inc. He continued: "Not only is the Nation's industrial plant expanding to meet requirements of a steadily growing population, but it is also under pressure to reduce costs, thus accelerating the trend toward automation. Industrial machinery far from the end of its normal life is being hurried to the scrap heap by the induced obsolescence of still more efficient equipment. In 1955, machinery builders absorbed 8.6 per cent of all finished steel shipped. The rate in 1956 was approximately 9.6 per cent; in 1957, it may be over 10 per cent.

The highway program now represents the "most buoyant" user of finished steel products, and will require some $1,200,000,000 worth of highway construction and maintenance machinery and equipment, the panelists pointed out. Said Louis W. Prentiss, executive vice-president, American Road Builders Association, "Highway equipment sales outlook is bright for the coming year and future."

Look Back

The Department of Defense has concluded it has a tiger by the tail. Increasingly complex military equipment is creating snowballing problems of upkeep, repair, and maintenance. In an emergency, the problems could swamp all existing or planned upkeep facilities.

What to do? The Department of Defense is making plans to expand its repair facilities only where absolutely necessary and to draw largely upon existing or expanded commercial facilities, particularly in event of emergency. Procedures are outlined in a new directive. Called maintenance allocation planning, the new system will function in the upkeep field about like the Production Allocation Program does in acquiring military materiel. The production allocation plan is a self-triggering arrangement whereby producers know in advance what they are to produce under agreed-upon emergency conditions.

The new instructions will be of interest to machinery and machine tool people because of the shift in emphasis from the Armed Services to civilian operation of maintenance facilities. The official text announcing the new policy explains, in part: "The Department of Defense is progressively acquiring and utilizing vast quantities of highly complex materiel which requires ever-increasing maintenance support in both manpower and facilities."

Look Up

Some hint of the part that machinery, metals, and scientific brainpower will be called upon to play during the years ahead is contained in a recent report of progress made on the satellite program. As reported by the Naval Research Laboratory, lifting a "satellite" weighing 21.5 pounds to a point 300 miles above the earth will require a three-stage rocket 4 feet in diameter, 72 feet long, and weighing 22,000 pounds. The intricacies of precision manufacture stretch the imagination to the breaking point.

Dr. John P. Hagen, director of the project for the Naval Research Laboratory, explained that if all goes well, the first two rockets would discharge at intervals of one hundred fifty seconds each. The device would be expected to "coast" upward for nine minutes, after which the third rocket would fire for forty seconds. At this point, the rocket and satellite should be 300 miles above the earth, and the satellite should travel around the earth at 18,000 miles per hour for one year. If the satellite reaches only the 200-mile level, it would last some fifteen days; if 100 miles, less than an hour!

Washington Briefs

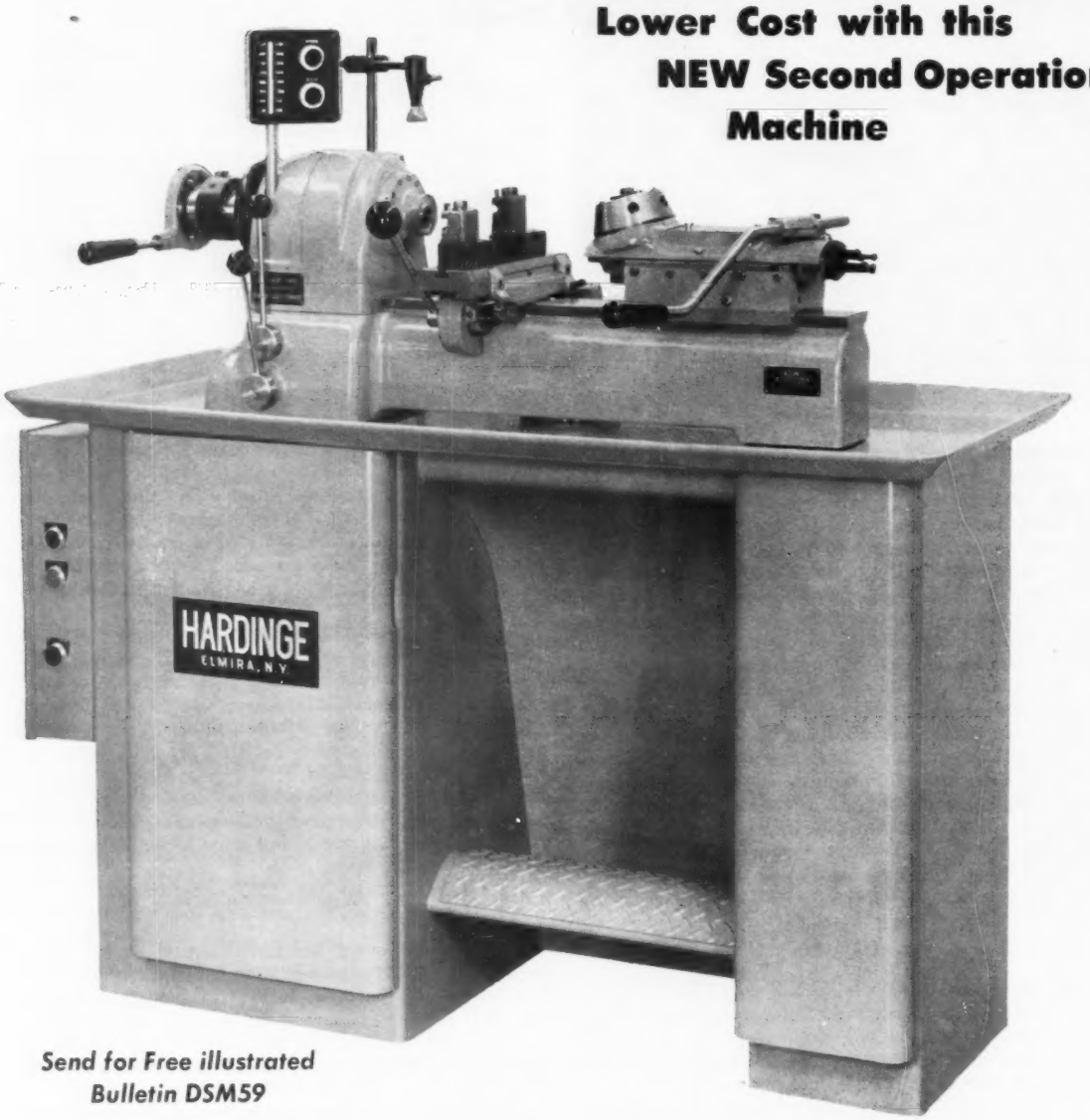
The Census Bureau has issued a preliminary report from the 1954 Census of Manufactures covering miscellaneous primary metal industries (MC-33-4). Reported for 1954: iron and steel forgings shipped, $595,434,000; wire drawing, $1,266,436,000; welded and heavy-riveted pipe, $525,788,000; and primary metal industries not listed elsewhere, $538,576,000.

Armed Forces are being asked to consider more technological training for servicemen; less spit-and-polish. At hearings before the Patman Subcommittee of the Joint Economic Committee, witnesses testified that the Armed Services would not lose by spending their time and money on technical training, since the technicians produced would, after discharge, take their places in the defense arsenal of industry.

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MACHINERY
FEBRUARY 1957

Good Roads to Everywhere

WHEN Gifford Pinchot became governor of Pennsylvania back in the twenties, one of the principal objectives of his administration was to "get the farmers out of the mud." Hundreds of miles of country roads were macadamized as a result of this program, and Pennsylvania became known as a state having convenient access into the hinterlands.

The greatly increased motor traffic of today has necessitated the development of modern highways on a gigantic scale that will completely eclipse Pinchot's ideas. This has resulted in the tremendous Federal program which covers the entire United States and calls for construction of a super highway network that will stretch from the Atlantic to the Pacific, and from Canada to Mexico. Our existing roads are no longer sufficient to get millions of trucks and automobiles quickly to their destinations. Of major importance, too, is the indispensability of an adequate highway system to all sections of the country in case of a national emergency. The new highways will meet a real need — they should not be considered a luxury.

The billions of dollars to be spent on this project will bring high employment and prosperity to a number of industries. Among them are the machine tool industry and the manufacturers of cutting tools, welding equipment, and other devices and appliances required for constructing the many types of earth-moving and road-building machinery that will be needed as the program gets under way. There will be a continuous demand for machinery-building equipment over the next decade because road-building machinery wears out due to the severe service it is required to perform and must be replaced.

The automotive industry, too, will benefit greatly from the road-building program. Trucks, transmissions, and other units will be required in large numbers.

Fortunately, the builders of road construction machinery have developed their products to a high state of perfection. Their immediate concern will be to turn out equipment to meet the coming demands rather than to engineer new designs.

Advanced manufacturing methods are already being used in their shops, as will be apparent from the articles published in this Road-Building Number. Efficient fulfillment of their responsibilities in the vast road-building program can be readily predicted.

Charles O. Herb

EDITOR

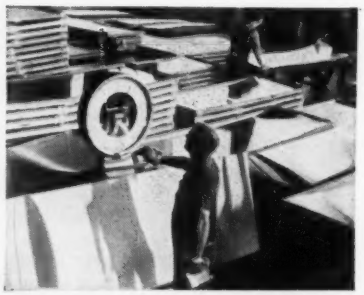
BUYERS GUIDE TO STAINLESS

A Directory of Ryerson Stainless Steels and Services

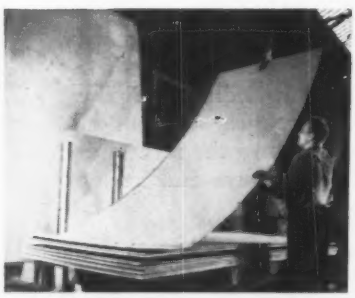
Here's a quick guide to the nation's largest stocks of stainless steel—2,351 sizes, shapes, types and finishes of Allegheny stainless in stock at Ryerson.

This wide selection assures you of getting the best stainless for every application. Extra care in storage, handling and shipping—such as padded shear clamps to protect finish and flatness of sheets—guards the high quality of Ryerson stainless stocks. And in addition, the help of full-time stainless specialists is yours when you call Ryerson.

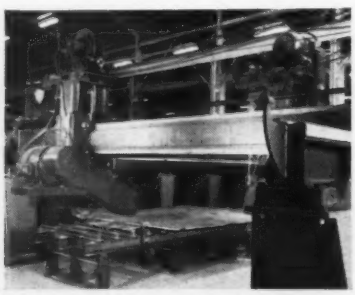
See your Ryerson catalog for a complete listing of stocks and call your nearby Ryerson plant for quick shipment of Allegheny stainless—one piece or a truckload.



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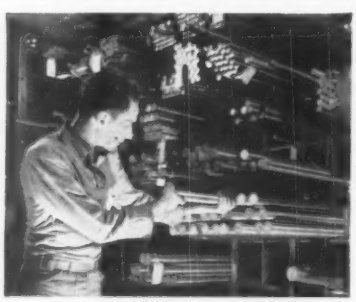
PLATES—Available in 9 analyses including plates to Atomic Energy Commission requirements and to ASTM specifications for code work. Also extra low carbon types for trouble-free welding.



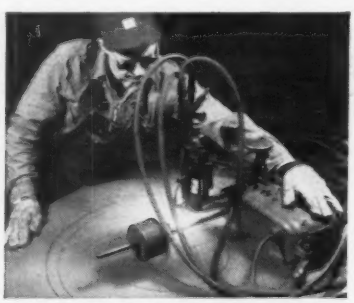
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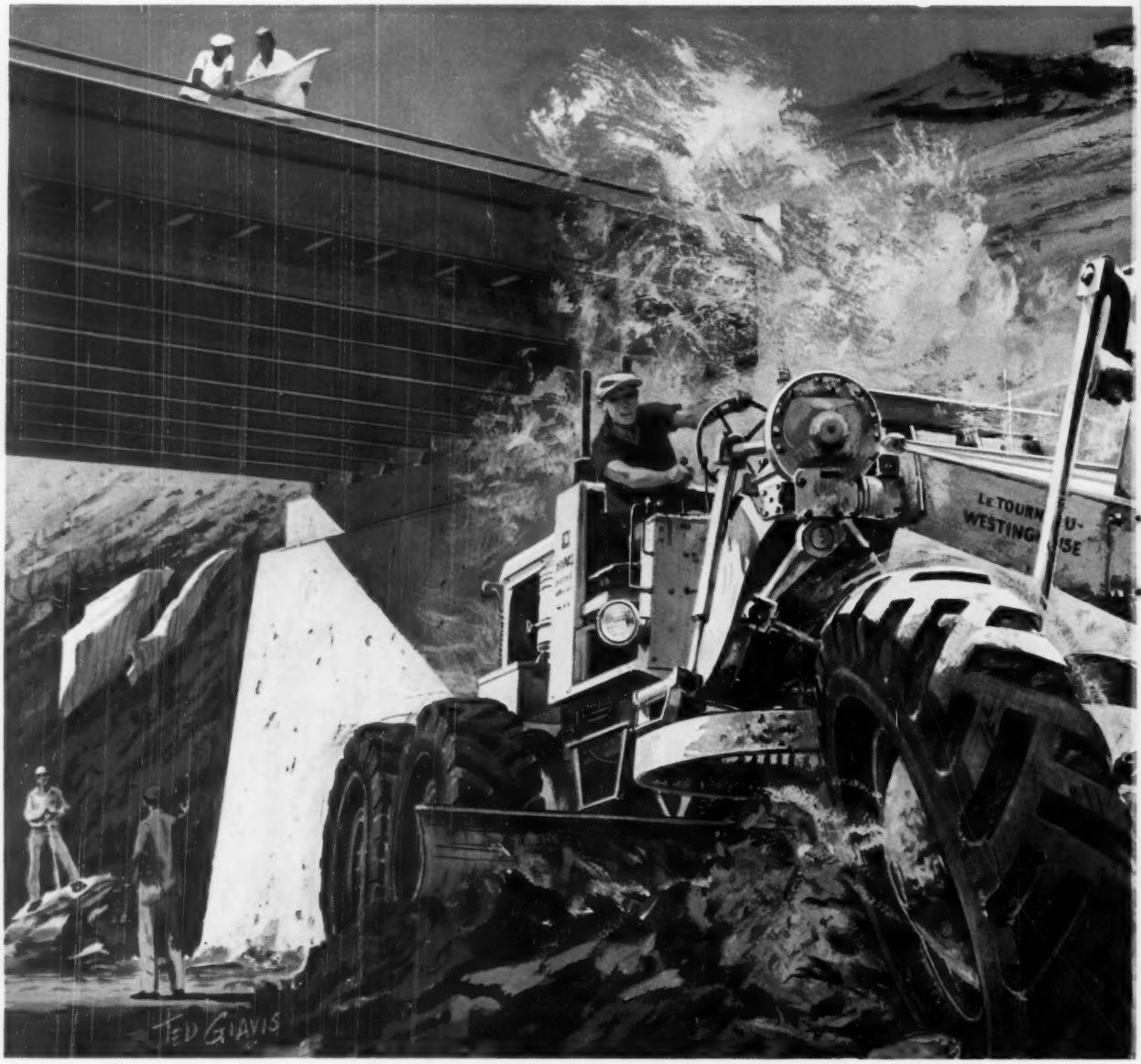


ROAD-BUILDING—BIG BUSINESS FOR METALWORKING

By CHARLES H. WICK, Managing Editor

PASSAGE of the Federal Aid Highway Act of 1956 was a major achievement of the Eisenhower Administration and a praiseworthy example of nonpartisan legislation on the part of the Eighty-Fourth Congress. The program is designed to accommodate estimated 1975 traffic needs by providing a 41,000-mile interstate highway system plus a supplementary secondary system totaling 508,000 miles. The interstate highway system alone will carry one-seventh of all traffic and connect about 90 per cent of the cities having a population of 50,000 or more. It will serve approximately 65 per cent of the urban and 45 per cent of the rural population.

Under the thirteen-year plan, the government will pay 90 per cent of the cost of interstate highways and 50 per cent of the cost of state and town roads. When the amount of Federal aid is added to estimated expenditures by state and local governments—conservatively based on current rates of spending—the outlay over thirteen years will reach the staggering total of



$88,000,000,000. If material, labor, and other construction costs continue to rise, even more money will be required. Some estimates project the cost over the next thirty years at $216,000,000,000. The plan has been called the greatest public works program in the history of the world. Yearly highway spending, which amounted to $4,600,000,000 in 1955, is expected to zoom to $8,000,000,000 by 1959.

The need for this tremendous undertaking is critical. More than 50 per cent of all paved roads in the country today were built before 1935, when vehicle registrations were under 25,000,000. Now, there are more than 60,000,000 faster and heavier cars, trucks, and buses. Few roads were built during World War II, and construction was curtailed during the immediate post-war years due to shortage of materials.

Practically every phase of our economy will benefit from the boom in road-building. Employment will climb and on-site wages to construction workers—amounting to about one-third of the total expenditure—will mean increased purchases of homes, clothing, autos, and appliances. Almost every car owner will profit from safer driving conditions, shorter travel time, and less fuel consumption. The Automotive Safety Council has predicted a reduction of 3500 automobile fatalities per year.

New and improved highways will attract



Illustration, courtesy of Detroit Diesel Engine Division, General Motors Corporation.

industry, with resulting benefits to the communities near the roads and the states in which they are located. It has been estimated that new plants valued at $150,000,000 have already been built near the New York State Thruway. This, in turn, will require the construction of new homes, restaurants, motels, and service stations.

Steel requirements for the roads themselves and for the machines and equipment necessary to build the highways will be huge. Qualified guesses put the total of structural shapes, piles, plates, bar, wire, and pipe that will be needed from 1957 to 1969 at 49,000,000 tons—more than 500 tons per million dollars' worth of road-building. The manufacture of increased quantities of road-building machines and earth-moving equipment will also mean big business for many subcontractors and small firms in the metalworking industry who supply castings, forgings, weldments, stampings, cylinders, gears, screw machine products, and similar parts. For example, the Oliver Corporation is anticipating an increase in its industrial business of approximately 15 per cent during 1957. As a result, the company expects a similar increase in their requirements for castings, forgings, and stampings.

Highway contractors have stated that they will have to invest $500,000,000 in new equipment for each $1,000,000,000 of highway construction above the existing level. This is in addition to



Photo, courtesy of Portland Cement Association

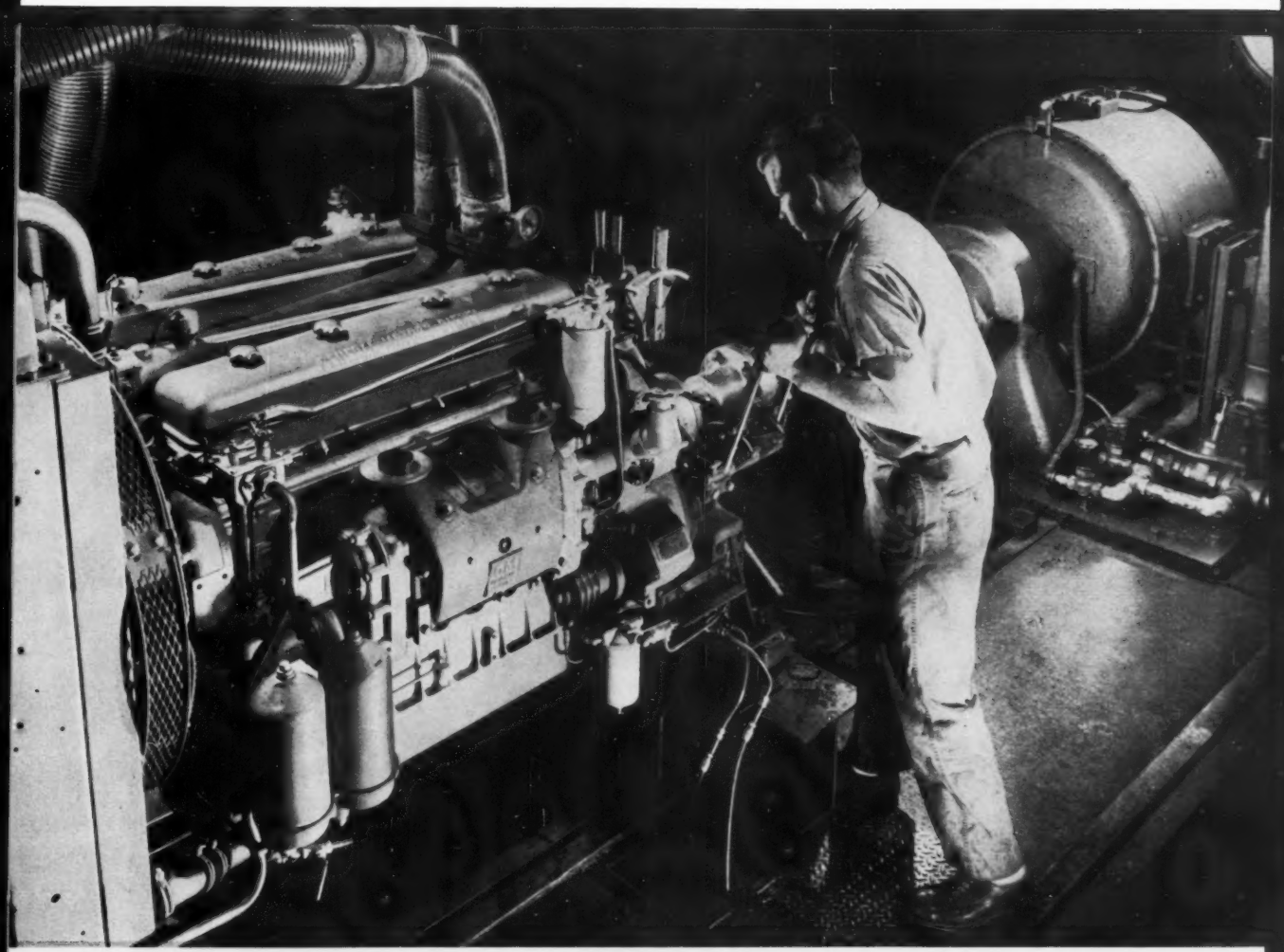
normal replacements of from 15 to 20 per cent. Sales of highway construction equipment—now about $2,000,000,000 a year—may triple within five years. As a result, manufacturers of road-building and earth-moving equipment will need new machines, more tools, and improved processes to boost their output. This will create a tremendous demand for all types of metalworking equipment.

Caterpillar Tractor Co. alone has invested approximately $200,000,000 since World War II in modernizing and enlarging facilities. In addition, Caterpillar announced early in 1956 that $200,000,000 more would be spent in the next four years for land, plants, and equipment.

LeTourneau-Westinghouse Co. has recently announced a $9,000,000 plant and tooling expansion program. Included will be a new factory at Peoria, which will be equipped with machine tools costing $2,500,000. Also, more than $1,500,000 worth of machine tools and equipment are being ordered to expand production at the company's Toccoa, Ga., plant, and $1,000,000 worth for the Indianapolis plant.

Euclid Division of General Motors Corporation, which now makes crawler tractors, scrapers, rear-dumps, and bottom-dumps at four Cleveland locations having more than 21 acres of plant facility, has announced plans to build a plant in New Hudson, Ohio.

During the fiscal year that ended October 31, 1956, Harnischfeger Corporation spent more than $2,500,000 on company-wide expansion and modernization. One of the new machines purchased —an Ingersoll four-head, planer type milling machine—cost $336,890.



DIESEL POWER FOR ROAD-BUILDING

By L. K. ROSENBERG
Assistant Works Manager, Facilities and Services
Detroit Diesel Engine Division, General Motors Corporation

DIESEL power has proved to be the most popular, economical, and satisfactory solution to diverse road-building requirements. The Detroit Diesel Engine Division of General Motors Corporation builds a complete line of single and multiple engine units with ratings from 30 to 893 H.P. Different sizes and models of these engines are available in more than 1000 applications of equipment built by over 150 manufacturers. Since 1938, when the first GM Detroit Diesel engine was put into service, engines totaling more than 70,000,000 H.P. have been produced.

To mass-produce engines for so many varied requirements necessitates flexibility of design and versatility of manufacturing equipment. The Model 71 engines are built with two, three, four, and six cylinders—all having the same bore and stroke. This results in numerous interchangeable parts and minimizes parts inventory.

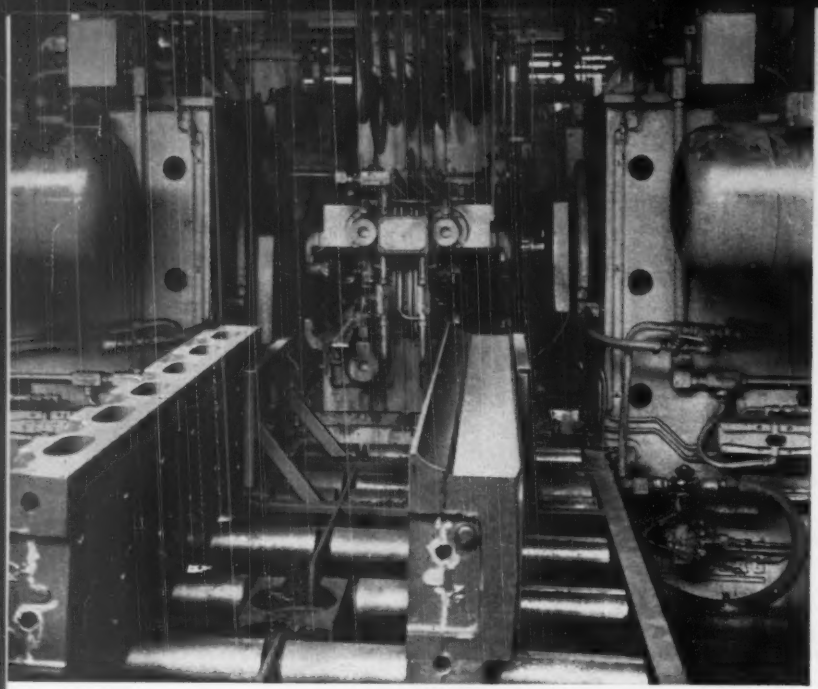


Fig. 1. (Left) Special horizontal milling machine with opposed, rise-and-fall heads for profile milling cylinder heads, two at a time.

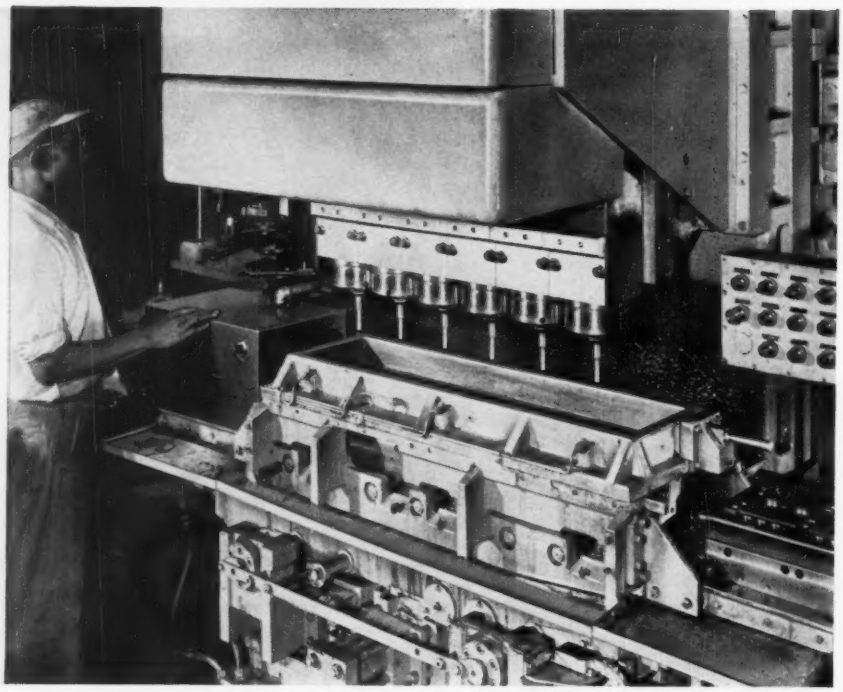


Fig. 2. (Right) This vertical boring machine can handle three-, four-, and six-cylinder heads having two or four valve openings per cylinder.

Cast-iron cylinder heads for the diesel engines are profile-milled two at a time on a special Fitchburg horizontal, duplex milling machine, Fig. 1. The profiled surfaces are rectangular-shaped top decks, approximately 36 inches long by 8 inches wide, within the confining rails of the castings. In operation, two heads are manually moved from a conveyor to the loading station of the opposed-head, rise-and-fall machine. The heads are loaded on edge, one with its exhaust side facing down, and the other with exhaust side up.

When the automatic cycle button of the profile mill is depressed, the two heads are hydraulically transferred into the work station, consisting of a double work-holding fixture. Here, the castings are hydraulically clamped after being located against their joint faces and by means of pins entering two holes in each work-piece. Simultaneously, two heads that have been profile milled in the previous cycle are automatically transferred to an idle station, seen in the foreground.

In profile milling, the two, insert type, carbide-bladed cutters (3 7/8 inches in diameter) are plunged into the castings to a depth of 1/4 inch.

Then, the machine table is hydraulically fed endwise at the rate of 20 inches per minute. When the length of the top deck surface has been milled, the heads are traversed vertically, and the table is fed in the opposite direction to complete the cut. During the vertical travel of the cutterheads, the two cylinder heads in the idle station are transferred to an unloading conveyor. The cutters operate at a surface speed of 300 feet per minute, and coolant is applied to flush away chips and improve tool life.

A high degree of versatility has been achieved in tooling the Ex-Cell-O vertical precision boring machine shown in Fig. 2 to accommodate both four- and six-cylinder heads having either two or four valve openings per cylinder. This six-spindle machine finish-bores holes in the heads for the valve guides, finish-bores and faces the bottoms, and chamfers the holes for subsequent shrink fitting of the valve inserts. The valve guide holes (0.5622 inch in diameter) and insert holes (1.6265 inch in diameter) are both bored to a tolerance of plus or minus 0.0005 inch, and must be held concentric within 0.001-inch total indicator reading.

Heads are manually loaded into the fixture of the boring machine from a roll conveyor and hydraulically clamped upward. In the automatic machining cycle, the tools are rotated at 2000 R.P.M. and fed at the rate of 0.002 inch per revolution for boring the valve guide holes. Then, for boring and facing the valve insert holes, the spindle speeds are automatically decreased to 1000 R.P.M., and the feed rate is increased to 0.004 inch per revolution. For chamfering, the speed remains the same, but the feed changes to 0.001 inch per revolution. About 0.015 inch of stock is removed per side.

When the operations have been completed, the spindles stop rotating, the machine head rises, and the fixture indexes longitudinally. Then the boring cycle is repeated to finish the other valve hole for each cylinder. If the head has four valve openings per cylinder, the fixture is also cross-indexed automatically. After unloading from the machine, the heads are inspected with air gages.

Hardened, chilled cast-iron valve seats (which have been pressed into the cylinder heads after heating the heads and freezing the inserts) are finish-ground to an included angle of 120 degrees on a special machine, Fig. 3, designed and made by Detroit Diesel. The machine consists basi-

Fig. 3. Special machine designed by Detroit Diesel for grinding hardened valve seats that have been pressed into cylinder heads.

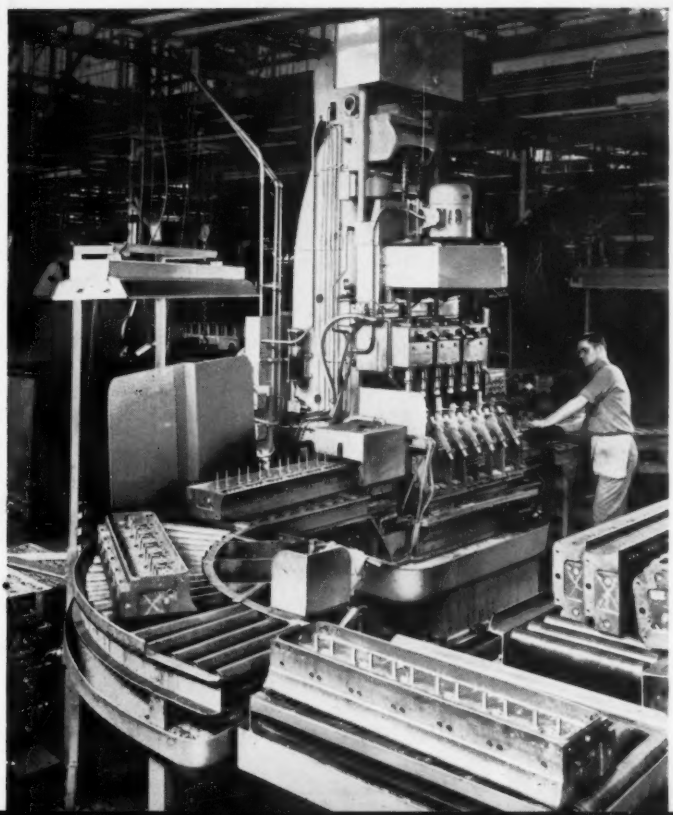
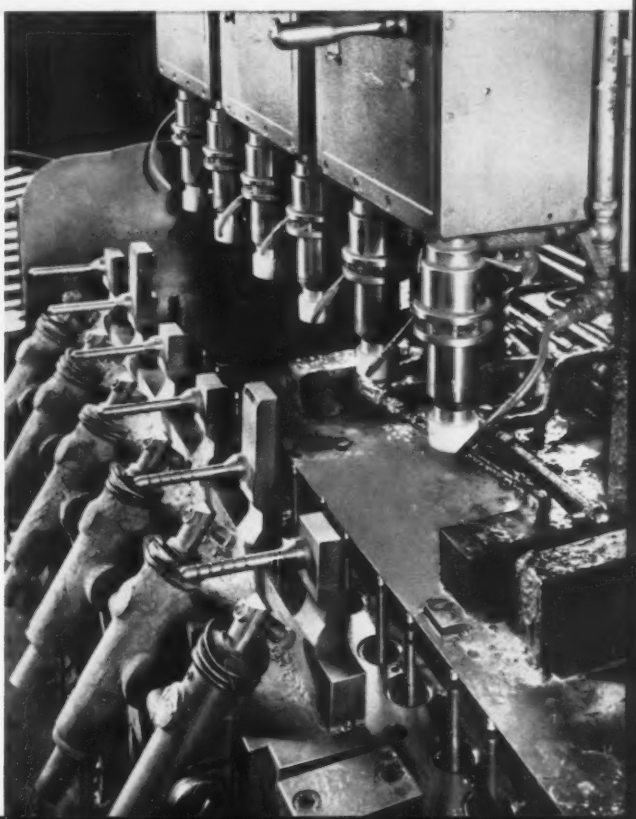


Fig. 4. Close-up of machine seen in Fig. 3 shows multiple-diamond dressing unit at left. The grinding wheels move in eccentric paths.



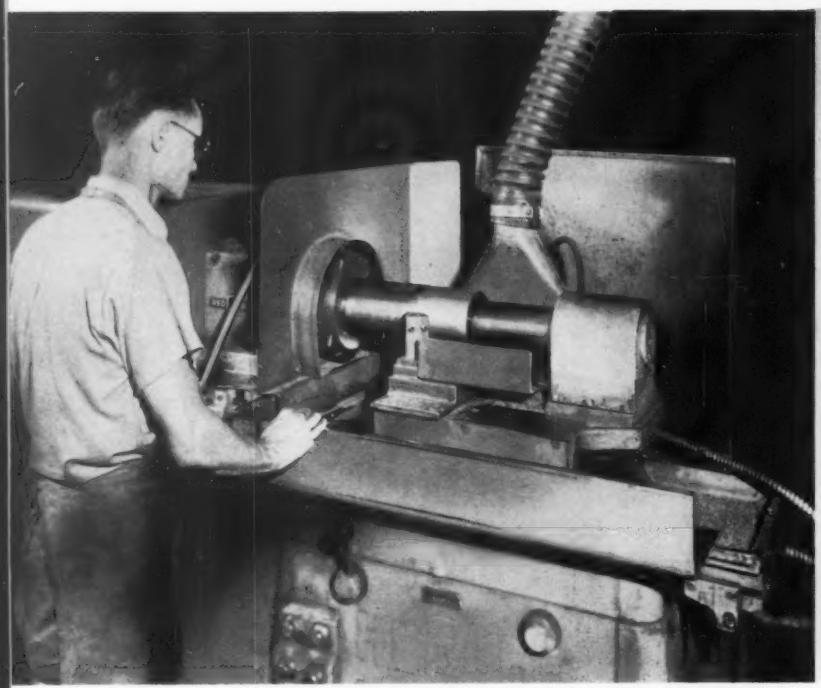


Fig. 5. Tubular cylinder liners are bored and turned simultaneously on this special machine. This has helped to produce a more uniform wall thickness.

cally of a standard Footburt vertical column carrying a modified hydraulically operated head that is lowered against adjustable screw-stops. The head carries six spindles, all belt-driven from a single, 3-H.P. motor. While the floating abrasive wheels themselves are rotated at 10,000 R.P.M., they are moved in an eccentric path at 25 R.P.M. by means of Hall type gear-boxes.

Prior to valve-seat grinding, the operator inserts expanding pilots in the valve guide stems and pushes the head from a roller conveyor into the work-holding fixture, Fig. 4. When the casting has been clamped and located by hydraulically operated elevating wedges, the machine head is automatically lowered into grinding position, feeding at the rate of 0.020 inch per minute. The pilots enter the grinding wheel bores for accurate location. Vitrified bond, aluminum-oxide abrasive wheels (1 5/8 inches in diameter by 1 inch wide, of 80 grain size, medium grade and open structure) are employed. From 0.009 to 0.010 inch of stock is ground per side from the valve seat.

After finishing six valve seats, the machine head is automatically raised, and the fixture is indexed transversely. Then, the cycle is repeated

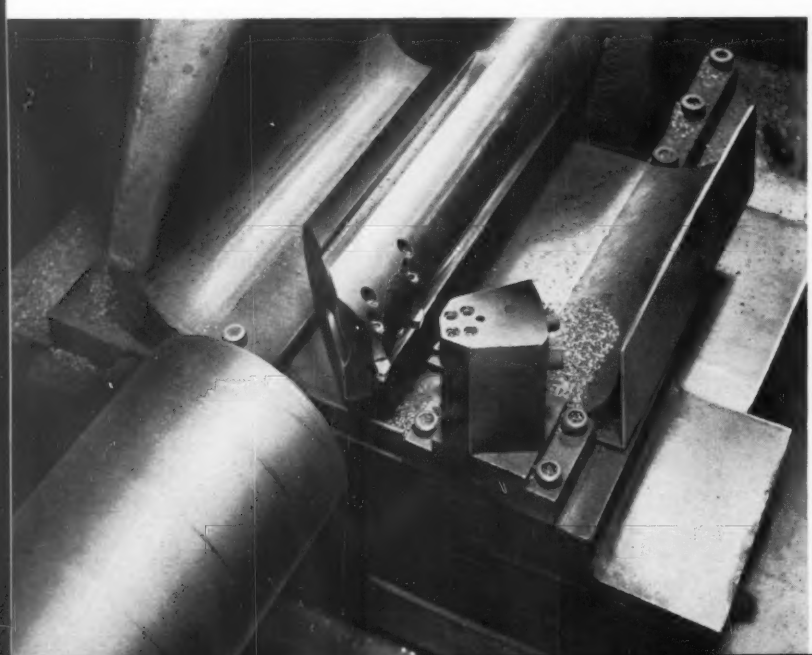


Fig. 6. Four tungsten-carbide bits are provided for boring and turning cylinder liners. One of the two turning tools finishes the body and the other, the flange.



Fig. 7. Multiple air gages are used to check the bores, outside diameters, and out-of-roundness of the liners.

to grind the other six seats. A special mechanism in the stops compensates for wheel wear and dressing and allows the machine head to be fed deeper each cycle. After grinding the seats in two heads, the wheels are dressed. The pivoted dressing unit (left in Fig. 4), containing six diamonds and a pilot for each wheel, is simply swung down into place for this operation. Oscillation of the wheels is stopped during this angular dressing. Prussian blue is applied to all ground seats to insure accurate valve seating.

One feature of Detroit Diesel engines is the use of replaceable, dry type cylinder liners. These cast and heat-treated liners are a slip fit in the cylinder blocks to facilitate replacement. The liners range from 4 1/4 to 5 1/2 inches in diameter, are 9 7/16 to 12 3/4 inches long, and have a wall thickness of about 3/16 inch. They are centrifugally cast in ceramic molds from gray cast iron to which 0.35 per cent of chromium has been added to promote hardenability.

Liners of high quality having a very uniform wall thickness are being produced economically by boring and turning the tubular castings simultaneously on a battery of special Heald Bore-Matics such as the one seen in Fig. 5. This unorthodox method of machining such long parts has proved very satisfactory, and the liners are completed in one-third the time formerly required. Previously, the rough castings were placed on an arbor and their peripheries turned. Then, they were placed in pot chucks and bored with a four-bladed cutter.

Now, a three-jaw chuck locates and clamps the rough-turned castings on a clamping ring cast integral with the liner and removed completely in a subsequent operation. The boring-bar, seen in Fig. 6, has two tungsten-carbide bits, both set to bore to the same diameter so that the rear tool only removes clean-up stock. Two tungsten-carbide bits are also mounted on the tool-slide—one for turning the liner body and the other for the flange. The use of opposed boring and turning tools simultaneously balances the cutting forces and steadies the work. The work is rotated at 176 R.P.M., and the tools are fed at the rate of 4.76 inches per minute. Approximately 0.030 inch of stock is removed from both the bore and periphery. Since the cutting cycle is completely automatic, only one man is required to operate five machines.

The liners are martempered and then finished by grinding and honing. A tolerance of plus or minus 0.001 inch is maintained on the outside diameters, plus or minus 0.0015 inch on the bore, and 0.004-inch total indicator reading on out-of-roundness. Adherence to these specifications is checked by means of Moore and Pratt & Whitney air gages, as shown in Fig. 7.

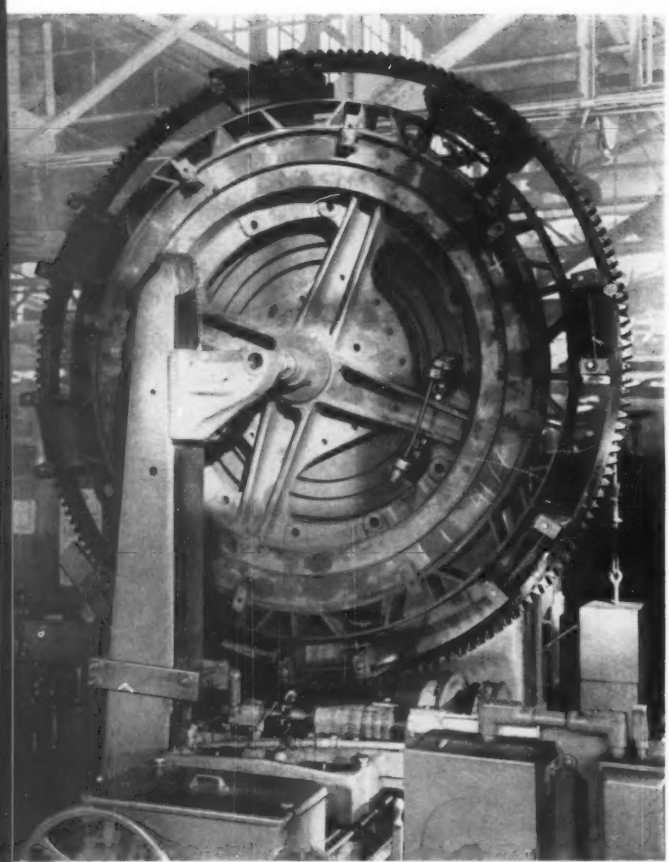
Considerable trouble was encountered at Detroit Diesel in uniformly hardening helical timing gears (made from SAE 1141 medium-carbon, free-machining steel forgings) to appreciable depths below the surface. It is necessary to produce a uniform hardness of 26 to 32 Rockwell C

(*Continued on page 201*)

By JOHN J. BOGNAR
Chief Industrial Engineer
Koehring Co., Milwaukee, Wis.

KOEHRING

Nothing in the plants of the manufacturers of road-building equipment appears to be on a small scale. A tour of a typical machining line reveals a veritable hall of giants, including boring mills, radial drilling machines, and gear-cutting machines. A side trip to a plate shop discloses how huge structures which dwarf the individual are manipulated and welded. Just about everything is big . . . everything but the tolerances on the drawings.



FROM terrain excavation to highway paving, many phases of road-building involve equipment manufactured by Koehring Co., Milwaukee. Among the products of this company and its subsidiaries are excavators, concrete pavers and finishers, trench diggers, mud jacks, tandem rollers, aggregate and cement batchers, and complete asphalt and concrete plants.

Creating a ribbon of concrete—always a dramatic sight to the layman—is typified by the activity in the heading illustration. At the left, a dump truck carrying required proportions of dry aggregate and cement from a batching plant backs into position behind a paver. The loading carriage, or skip, of the paver swings down to receive the batch, then swings up to discharge it into a revolving double-compartment drum. Upward movement of the skip starts the flow of a prescribed amount of water into the mixing drum, ahead of the aggregate and cement.

Fig. 1. Form-milling the teeth of a 112-inch ring gear. This gear is welded to the outside of a cement-mixer drum.

PAVES THE WAY



Just previously a transfer chute has operated to move the preceding batch from the first compartment of the drum to the second compartment. After a mixing interval, a large bucket mounted on a horizontal boom on the front of the paver will retract toward the drum, where it will be charged with the batch in the second compartment. Then the bucket will move out on the boom, dumping the batch where needed.

As seen in the illustration, semifinishing and finishing machines follow the paver. These machines, rolling over the steel forms at the sides of the roadbed, screed the batch once it is dumped from the bucket. The oscillating movements of the machines—the semifinisher oscillates lengthwise of the road, and the finisher crosswise—spread the concrete evenly and leave it to set with a characteristic ribbed pattern that provides a nonslip surface.

The paver remains stationary while a series of batches are mixed and dumped. Since the distance the bucket can move out on the boom decreases for each batch, the paver must move intermittently on its crawlers several feet—to the left in this particular instance—for each subsequent series.

Like most manufacturers of road-building and construction equipment, Koehring must handle massive components in limited quantities. Many striking cutting, forming, and welding operations are performed in the company's machine shop and plate shop. A few are described here. They are of unusual interest mainly because of the large size of the work-pieces.

In Fig. 1, teeth are being gashed into a ring gear for a mixer drum. The work blank is a carbon-steel forging, about 112 inches in diameter. There are 180 1-pitch teeth, milled with a special 8 3/4-inch cutter.

The faceplate supporting the fixture contains a series of circular T-slots, so that it can be used with various sizes of gears. A large spider is fastened to the faceplate and, in turn, contains an arbor which at both ends runs in counterweighted brackets over the center line of the cutter. Teeth are cut individually as the cutter spindle advances inward. When the spindle retracts, the fixture indexes automatically. All teeth are roughed in one pass, then finished in another. Subsequently, the ring gear will be welded to the drum of the mixer.

Shovels, hoes, cranes, and draglines make up

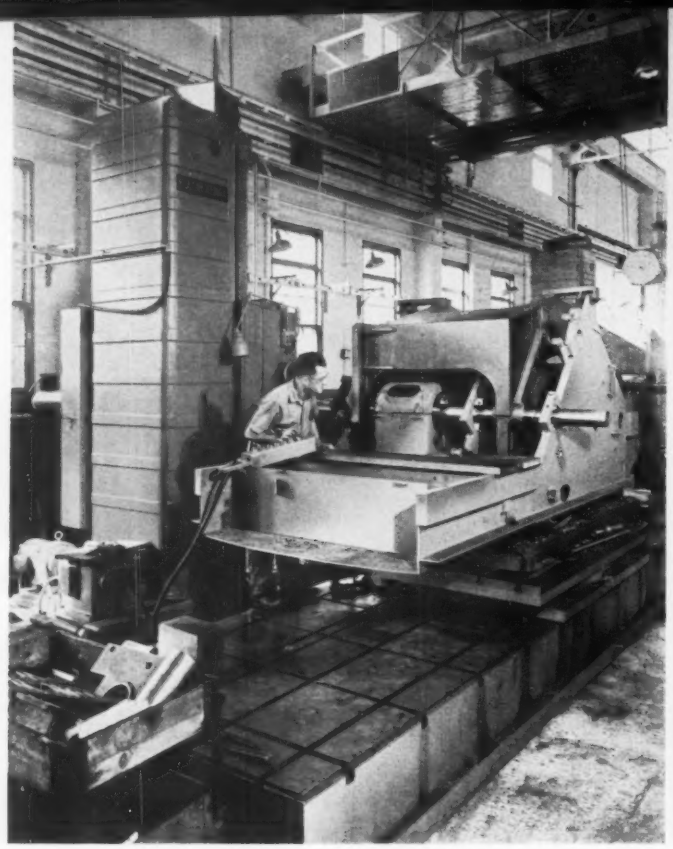
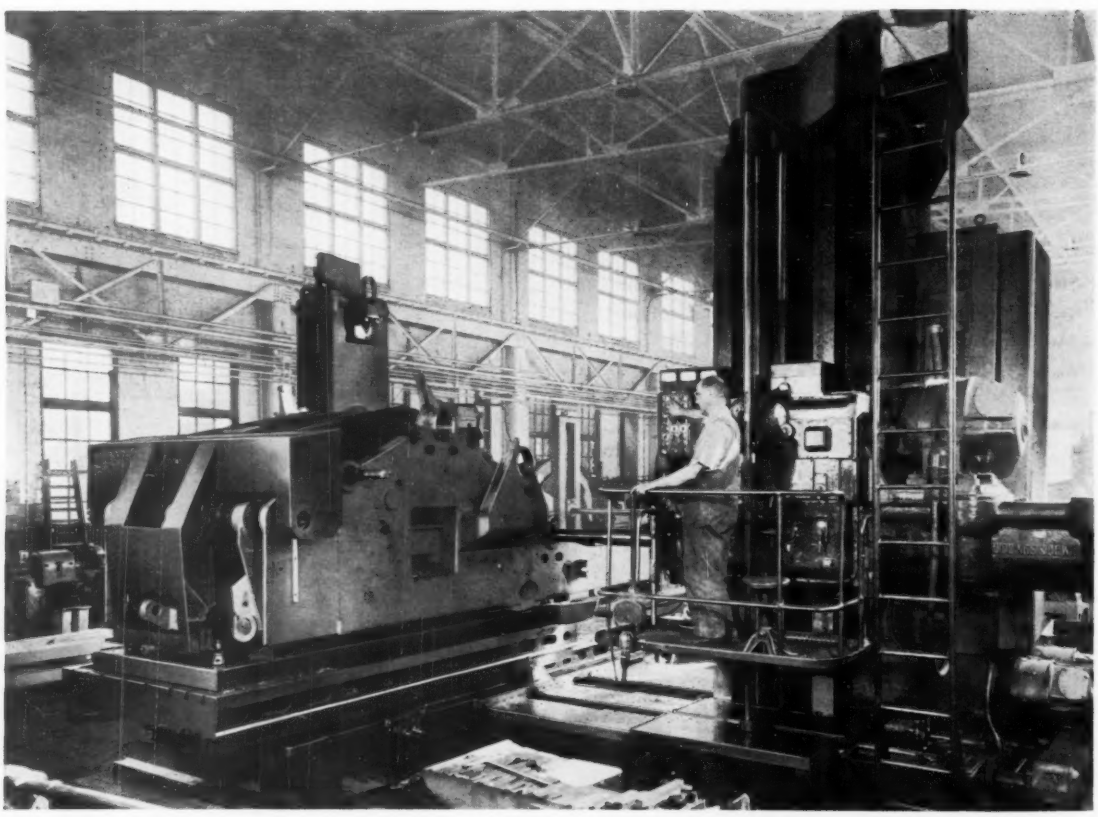


Fig. 2. (Left) Line-boring and facing the horizontal swing and traction shaft holes in a 2-yard excavator turntable.

Fig. 3. (Below) Massive but precise. Tolerances for the line-bores in this 10,000-pound turntable are on the order of plus 0.002 inch, minus 0.000 inch.



a general class of equipment known as excavators. All excavators are basically alike, having a crawler- or tire-mounted revolving frame called a turntable. Specific end use of the excavator is governed by the design of such attachments as booms, scoops, and cables. It is thus easy to convert an excavator in the field from a shovel to a hoe, for example, by changing the attachments.

Boring Mills are Important to the Equipment Builder

A turntable for a 2-yard (shovel capacity) excavator is shown in Fig. 2 undergoing a series of line-boring and facing operations. The work, 5500 pounds in weight, is fabricated of plate and cast steel. When installed in the excavator, the turntable houses the diesel engine and all controls for moving and operating the equipment. It rotates on four sets of rollers over a part known as the car body. To drive the turntable, a vertical pinion engages a ring gear welded to the car body.

Davis block type cutters rough, semifinish, and finish all bores and faces. As many as five surfaces are line-bored simultaneously. The machine tool is a 5-inch Kaukauna horizontal boring mill. It stands on a common runway, 36 feet long, with an identical boring mill partly visible behind the work in the illustration. On the floor in front of the mills is a heavy, stationary bed, approximately 6 feet wide and 45 feet long. This arrangement permits the two boring mills to be used independently on different work-pieces or positioned on the runway where they can be used together on the same work-piece.

The work-fixture is positioned within the sides of the turntable. Boring-bars are piloted in bushings welded into the fixture walls. So that a series of drilling, reaming, and tapping operations can be performed subsequently in the turntable sides from the initial setup, the fixture is mounted on a Giddings & Lewis air-lift table. When the work has to be indexed, a valve at the base of the air-lift table platen is opened, and compressed air raises the platen about 0.001 inch. It is then easily rotated manually, and the valve is closed, settling the platen on its seat.

An even larger turntable, for a 3-yard excavator, goes through similar line-boring and facing operations on a Giddings & Lewis 6-inch boring mill, Fig. 3. This work-piece weighs over 10,000 pounds. The presence of the operator in the illustration affords a good idea of the mammoth proportions of the work and machine tool. Boring-bars alone are so big that they must be positioned and removed with the aid of a traveling crane.

Despite the large sizes involved, machining is close. For example, two 6.625-inch holes for a drum shaft, 60 inches apart, are line-bored to a tolerance of plus 0.002, minus 0.000 inch. Other close line-bored holes receive a counter shaft, jack shaft, boom hoist drive-shaft and drum shaft, retract shaft, boom foot shaft, fair-lead, "A" frame, and drum idler pinion shaft.

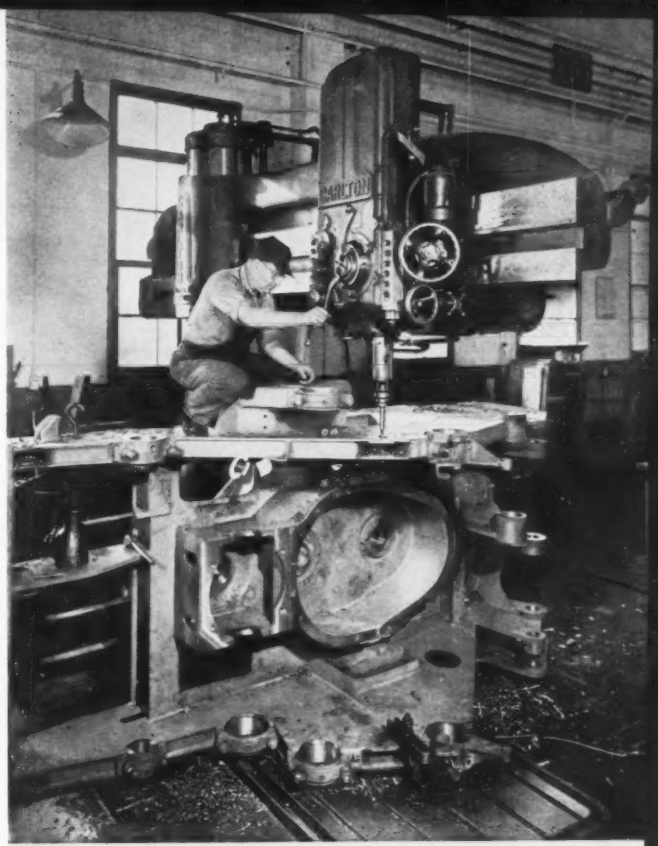
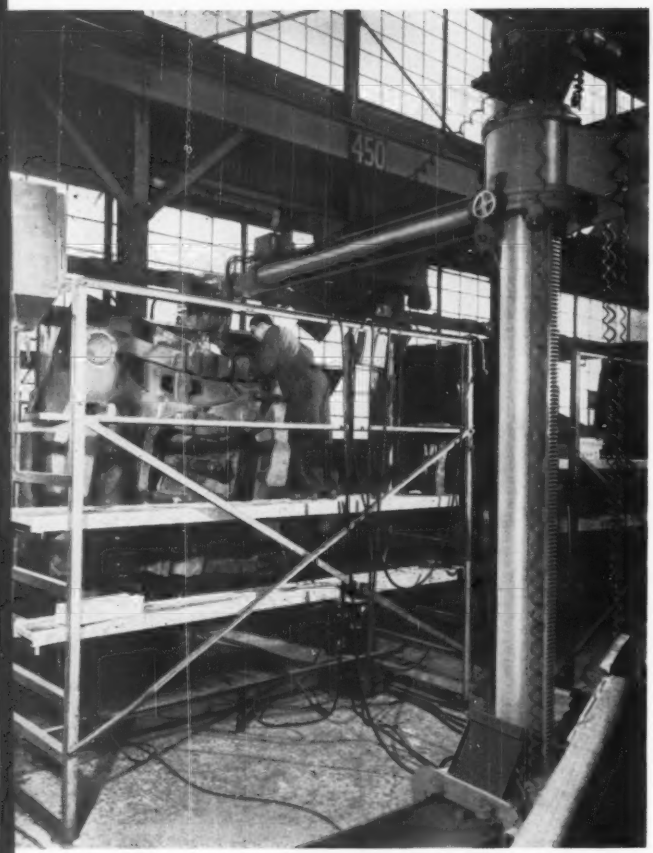


Fig. 4. Drilling and tapping lock plate and bracket holes in sides of a 3-yard turntable. Completed line-bores in the sides are visible.

After leaving the boring mill, the 3-yard turntable goes to a radial drilling machine, Fig. 4. Here, the work rests on each side, in turn, while holes for lock plates and brackets are drilled and tapped in the opposite side. The machine tool is an 8-foot Carlton with a column diameter of 19 inches. Drills and taps are held in a quick-change chuck. A 15-H.P. motor powers the drill.

Mechanized Welding Procedures Complement Machining

The car body is a steel plate fabrication. One of the welding operations on a 3-yard car body is illustrated in Fig. 5. The operator is performing a submerged-arc circumferential weld. A Harnischfeger positioner holds the work and rotates it in a vertical plane while the operation is in



progress. There is an integral hydraulic mechanism in the positioner which initially raises the car body from the floor to the welding head.

Lincoln welding equipment is used. The welding head is supported over the work area from the beam of a Lewis motorized fixture. For some of the other welds made on the car body, the work remains stationary, and either the welding head travels along the boom or the column supporting the boom travels along a runway on the floor.

Subsequently, a large steel casting is tacked and welded with low-hydrogen rod to the car body in a rheostat-controlled positioner. The mouth of the casting is a ring gear which meshes with the vertical pinion of the turntable.

Then, the car body and ring gear undergo machining on the vertical boring mill seen in Fig. 6. The face of the gear is beveled, two outside diameters are turned, and the internal diameter of the gear teeth is cleaned up. (Involute form of the teeth is left as cast, without machining.) In addition, a central hub is bored and turned. The machine, a Giddings & Lewis "Hypro," has a table diameter of 10 feet.

A conical center plate for a car body is flame-cut from 1-inch flat stock, then formed on a hydraulic press. The initial flame-cutting operation is shown in Fig. 7. An Oxweld machine, operating on natural gas, is employed. First, a 1 1/2-inch

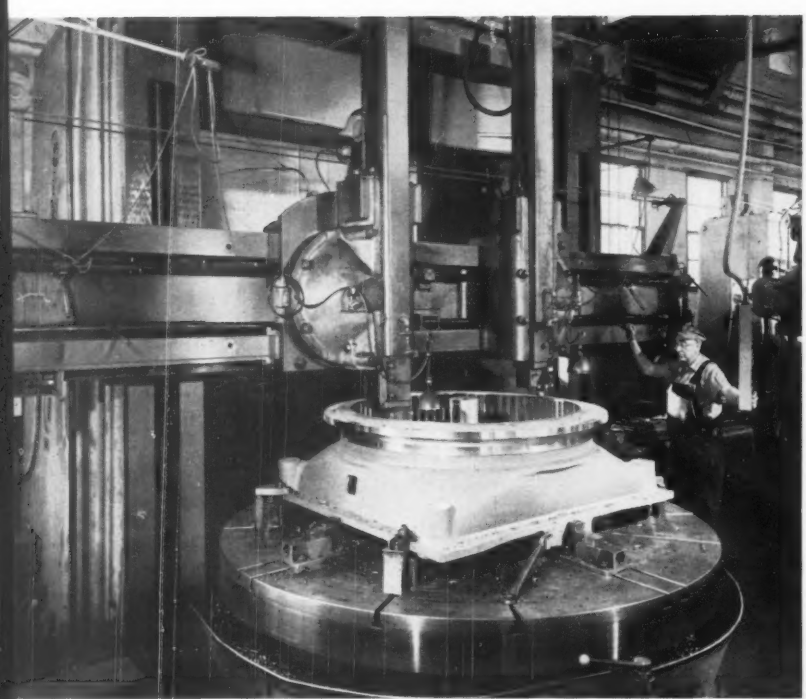


Fig. 5. (Above) The car body rotates in a vertical plane while a submerged-arc circumferential weld is made.

Fig. 6. (Left) After the ring gear is welded to the car body, it is bevel-faced and turned, as well as bored, on this vertical boring mill.

pilot hole for the press operation is cut in the plate center. Then, the 40 3/4-inch outside diameter of the cone is cut.

After being formed to a 14 1/2-degree (base angle) cone, the work is returned to the cutting machine. A 10 1/4-inch central hole and a 4- by 6 1/2-inch slot are then flame-cut.

Templates are grouped on a piece of plate stock, seen on the table behind the operator. Each template is in the form of an aluminum rail which is riveted to the plate. The drive unit has a pair of serrated, beveled rolls which guide the cutting torch by following the contour of the rail. The rolls are motor-driven, and automatically control the movement of the cutting torch over the work.

Window panels for excavator cabs are also flame-cut, then, after a series of small holes are punched, the panel edges are bent up on a press brake. One of the bending operations is illustrated in Fig. 8. It is performed on a 600-ton Pacific hydraulic press brake. Some of the other parts bent on this machine are up to 3/4 inch thick and 12 feet long.

Modern machines and manufacturing techniques will continue to help Koehring meet the accelerated demands of the road construction industry. Extensive company research with ceramic tools, for example, has already been instrumental in raising production.

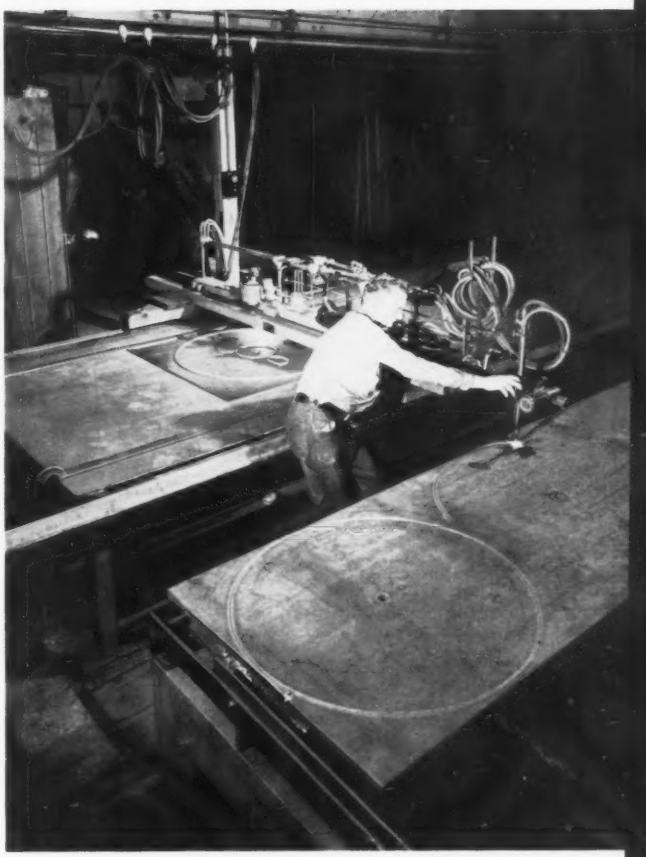


Fig. 7. (Above) Flame-cutting with natural gas. The machine controls the path of the cutting torch by means of a roller contact with an aluminum rail template.

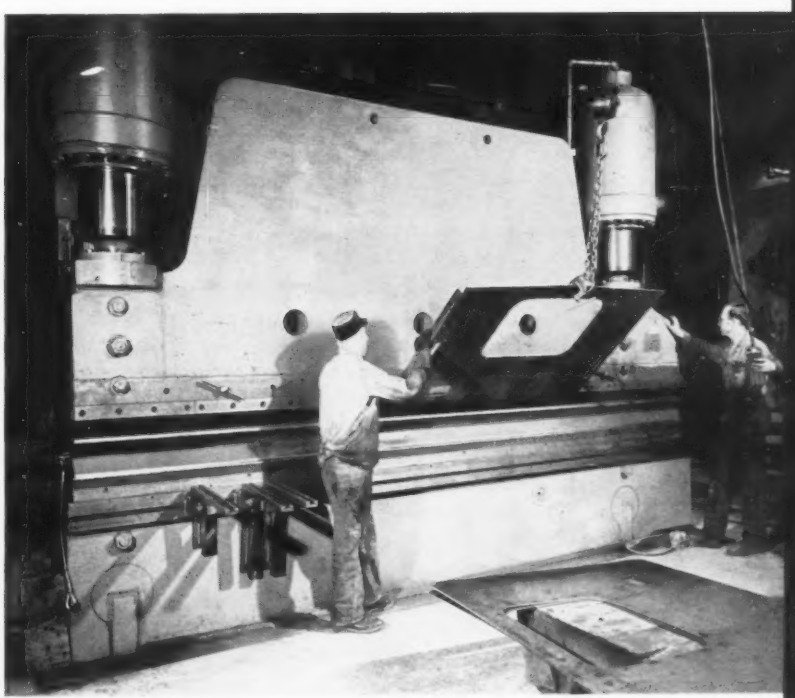


Fig. 8. (Right) Forming the edges of a cab panel in a press-brake operation.

BUILDING EUCLID TWIN-POWER EARTH-MOVING EQUIPMENT

By CHARLES H. WICK
Managing Editor



Fig. 1. Automatic submerged-arc welding machine for joining forged steel track-roller halves. Welding is performed at 500 amperes and 26 volts.

INCREASING demands of the road-building industry for more power and greater earth-moving ability are being met by twin-power equipment made by the Euclid Division of General Motors Corporation, Cleveland, Ohio. With the twin-power principle, paired diesel engines—each driving a separate axle through torque converters and semi-automatic transmissions—are used. First introduced on the 34-ton rear-dump, the principle has now been applied to the 50-ton rear-dump, the 18-yard scraper, and the new 388-H.P. crawler tractor.

Twin-power units, as well as single-engine scrapers, rear-dumps, and bottom-dumps ranging from 7- to 25-cubic-yard capacity are built in four Cleveland locations having more than 21 acres of plant facility. New tooling and improved manufacturing processes have recently been incorporated at these plants to boost the output.

Track rollers for the crawler tractors consist of two steel forgings that are automatically welded together by means of the setup seen in Fig. 1. The forged track-roller halves are first turned and faced on a Sundstrand lathe. Then, the parts are rolled on a gravity chute through a gas-heated oven, where they are heated to a temperature of 300 degrees F., in order to minimize distortion during subsequent welding.

At the exit end of the oven, two pre-heated forgings are clamped simultaneously by the jaws



of a pair of air-operated universal chucks, and pushed together. A Lincolnweld submerged-arc welding head is then automatically lowered, and the work begins to rotate. The head operates at 500 amperes and 26 volts, and the 60-degree V-weld is completed at the rate of 14 inches per minute in three passes. Copper-coated steel welding wire, 5/32 inch in diameter, is supplied from an overhead reel by drive rolls, and granular flux flows from a nozzle to cover the weld area.

The machine, made by the Automatic Arc-Weld Mfg. Co., is equipped with an automatic flux recovery unit. An air-actuated chipping hammer is used by the operator to remove fused flux during the welding cycle. After welding has been completed, the track-roller assemblies are unloaded by means of the cradle type fixture seen in front of the machine.

Track-roller weldments are completely machined on a W. F. & John Barnes ten-station, in-line transfer machine, the loading end of which is shown in Fig. 2. This unique application of a transfer machine—believed to be the first in the earth-moving equipment industry—not only makes it possible to increase production, but also insures the output of uniformly high-quality products. On this machine, both ends of each track-roller assembly are bored, turned, chamfered, faced, drilled, and tapped in one continuous cycle. Six different assemblies are processed on the same machine with a minimum number of tool changes being required.

The work-pieces are manually loaded into box type pallet fixtures and power-clamped by means of a hydraulically operated wrench. Station 2 has been left idle to accommodate tooling for possible changes in the design of the parts. When a fixture has been automatically transferred to the third station, both hub ends of the track-roller assembly are rough-turned (4.38 inch diameter) and center-drilled (41/64 inch diameter). Three square, insert type carbide bits are used for turning. The spindles rotate at 355 R.P.M., providing a cutting speed of 405 feet per minute for turning, and feed first at the rate of 0.009 inch per revolution and then at 0.006 inch per revolution.

Seven insert type carbide tools are mounted on both the right- and left-hand spindles at the fourth station for semifinish-turning, bump facing, and chamfering. Two feeds (0.008 and 0.005 inch per revolution) are again used with a cutting speed of 300 feet per minute. When the track roller has been transferred to the fifth station, the hubs are finish-turned, shoulders are faced, and the centers are generated to an included angle of 60 degrees. Hydraulically operated feed-out spindles have been provided for the facing operations, and pivoting actuating bars are used for generating the centers.

Another surface on both ends of the track-roller assembly is turned, and the seal faces and 5/16-inch radii are generated at the sixth station. Six holes, 1/4 inch in diameter, are drilled to a

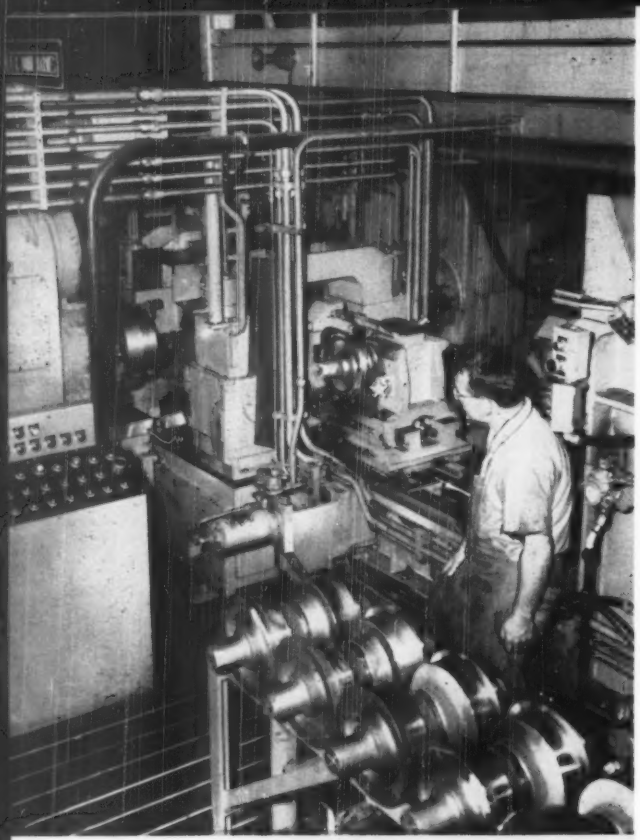


Fig. 2. Loading end of a ten-station transfer machine employed to bore, turn, chamfer, face, and tap both ends of track-roller assemblies.

depth of 1/4 inch, and one hole, 5/8 inch in diameter, is drilled to a depth of 2.78 inches at Station 7. These holes are subsequently chamfered at the eighth station and tapped at Station 9. When the parts are transferred to the tenth and final station, Fig. 3, they are unloaded. A power-operated wrench is provided at the unloading station for unclamping the work. Empty fixtures are returned to the loading station by means of a power conveyor.

Fillets at both ends of the track-roller assembly (on which the dirt seals ride during tractor operation) are flame-hardened on the Cincinnati Flamatic machine shown in Fig. 4. The assembly is placed on tracks and rolls into the hardening position, where it is rotated by drive rolls. Gas flames, ignited by electrodes, impinge on the rotating surfaces to be hardened. When these surfaces reach a temperature of about 1500 degrees F. (after seventy seconds of heating), the flames are automatically extinguished.

After a delay of 8.5 seconds, the surfaces are quenched with a water spray for twenty seconds. The part is then air-cooled from the residual temperature of approximately 375 degrees F. This results in a surface hardness of 55 Rockwell C and a minimum hardness of 45 Rockwell C at a depth 0.180 inch below the surface.

Induction heating is also used for selective hardening of many tractor and scraper parts. For example, Fig. 5 illustrates a Tocco induction-heating unit employed to surface harden track links. The forged steel links, which have

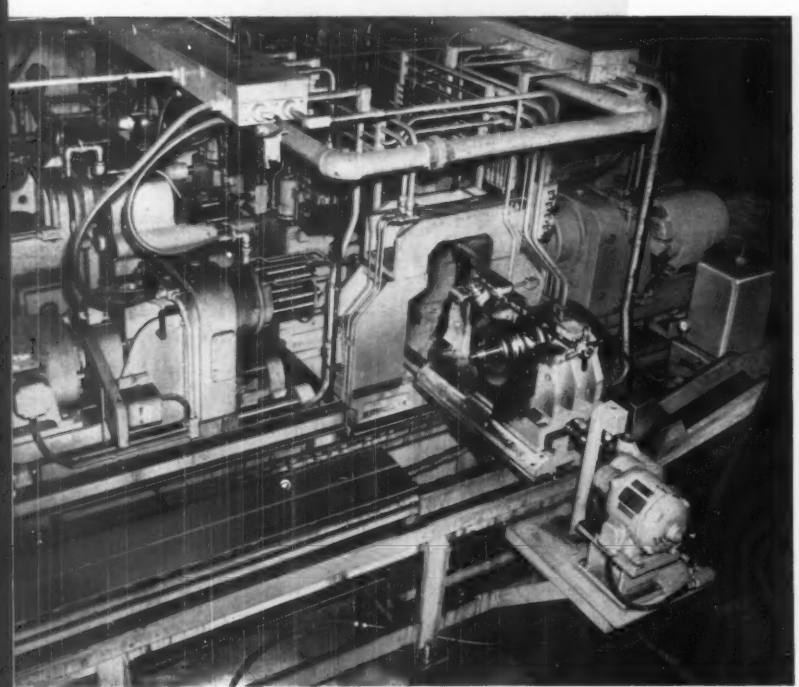


Fig. 3. Power wrench seen at lower right is provided to unclamp work. Empty fixtures are returned to loading station by conveyor.



Fig. 4. Track-roller assemblies are rotated on this Flamatic machine while gas flames heat fillets. Then, surfaces are water-quenched.

previously been milled or broached, are manually placed on a conveyor, as seen at the left. As the parts are transferred to the right, they successively pass the induction-heating coils, water-quench nozzles, and an exhaust fan (right).

Another example of a special transfer machine is shown in Fig. 6. This W. F. & John Barnes machine is used to bore, face, chamfer, drill, and tap seven semicircular bearing surfaces along each side of the welded steel frames for holding track rollers. The frame, approximately 9 1/2 feet long by 2 feet wide and 10 inches high, rests on adjustable pads and is manually clamped in a cradle type fixture that is transferred from station to station along the 27-foot long ways of the machine. Both the left- and right-hand machining units at the various stations are provided with locating plugs which enter bushings mounted along the sides of the fixture.

At the first machining station, the right and left heads are equipped with combination cutters to bore the semicircular bearing surfaces to a diameter of 5 1/2 inches, bump face the surfaces to 8 1/2 inches in diameter, and chamfer. Each



Fig. 5. Induction-heating unit for hardening surfaces of forged steel track links. Exhaust fan at right removes heat and water vapor.

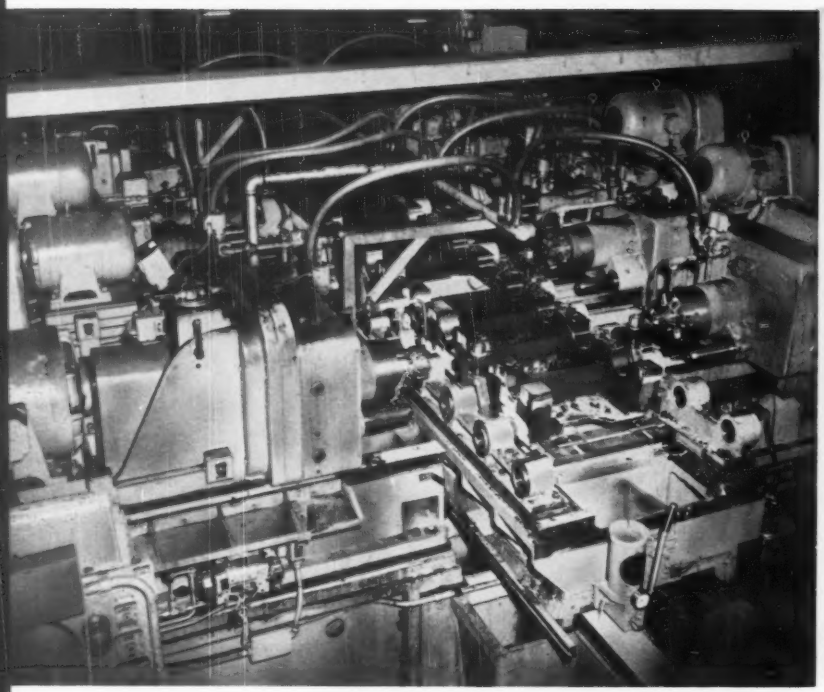


Fig. 6. Semicircular bearing surfaces along both sides of track-roller frame weldments are bored, faced, chamfered, drilled, and tapped on this transfer machine.

cutter has fifteen insert type, tungsten-carbide blades—eight for boring, six for facing, and one for chamfering. The cutters are rotated at 180 R.P.M., providing a cutting speed of 260 feet per minute for boring and 400 feet per minute for facing. A dual-feed arrangement allows a rate of 0.028 inch per revolution for boring (giving a chip load of 0.0035 inch per tooth) and 0.0055 inch per revolution for facing (a chip load of 0.001 inch per tooth).

The diameters of the semicircular bearing surfaces are increased to 5 3/4 inches at the next station. Then, when the track-roller frame has again been transferred, three holes in each side are drilled to a diameter of 21/32 inch by 1.88 inches deep, and chamfered. These holes are tapped (3/4-10 threads) to a depth of 1 1/4 inches at the final station. Scully-Jones compression type tap-holders having 40-pound compression springs are mounted on the self-leading tapping spindles. The tap drive heads are rapidly advanced to the tapping positions by means of hydraulic actuating units.

Final drive sprocket hubs, 33 1/2 inches in diameter by 18 inches wide and weighing 500 pounds, are completely machined on the large Potter & Johnston automatic turret lathe seen in Fig. 7. First, the cast part is gripped in a Cushman three-jaw, air-operated chuck, with the large open end of the hub facing the turret. In this position, the work-piece is rough- and finish-bored, rough- and finish-turned, straddle-faced, chamfered, and grooved. Stock removal averages from 1/4 to 5/16 inch per side, but as much as 7/8 inch of stock must be cut from the bore due to the draft of this surface. For straddle-facing, a cam is mounted on the cross-slide to actuate the facing tools mounted on the turret. Insert type tungsten-carbide tooling is used for all operations. Work-speed is varied from 29.5 to 95.5 R.P.M., providing cutting speeds from 90 to 420 feet per minute, and the tools are fed at rates ranging from 0.007 to 0.036 inch per revolution.

For the second operation on the same chucking machine, the position of the part is reversed, locating on a plug and against a plate by means of air-operated fingers that fit over the hub flange. With this setup, the part is rough- and finish-bored, and faced. The same range of work speeds is used to give cutting speeds from 95 to 360 feet per minute, and the tools are fed at rates from 0.014 to 0.036 inch per revolution. Approximately sixteen minutes (floor-to-floor time) is required for the first operation, while the second operation is completed in fourteen minutes.

Nine other scraper and tractor parts are machined on the same automatic turret lathe. On one cast-iron work-piece a hole approximately 3 3/4 inches in diameter by 7 inches long is finish-bored to a total tolerance of only 0.0008 inch. Before performing this precise operation, the machine is leveled by means of ten jacks built into the machine base. On another part, 31 1/2 inches in diameter, a turning tool mounted on the overhead support bar is actuated by cams mounted on one of the turret faces. This turning



Fig. 7. This large automatic turret lathe is employed to bore, turn, face, chamfer, and groove the final drive sprocket hubs, 33 1/2 inches in diameter.

operation is performed at a cutting speed of 750 feet per minute. The unusually high cutting speed is required because a small-diameter hole is being bored simultaneously.

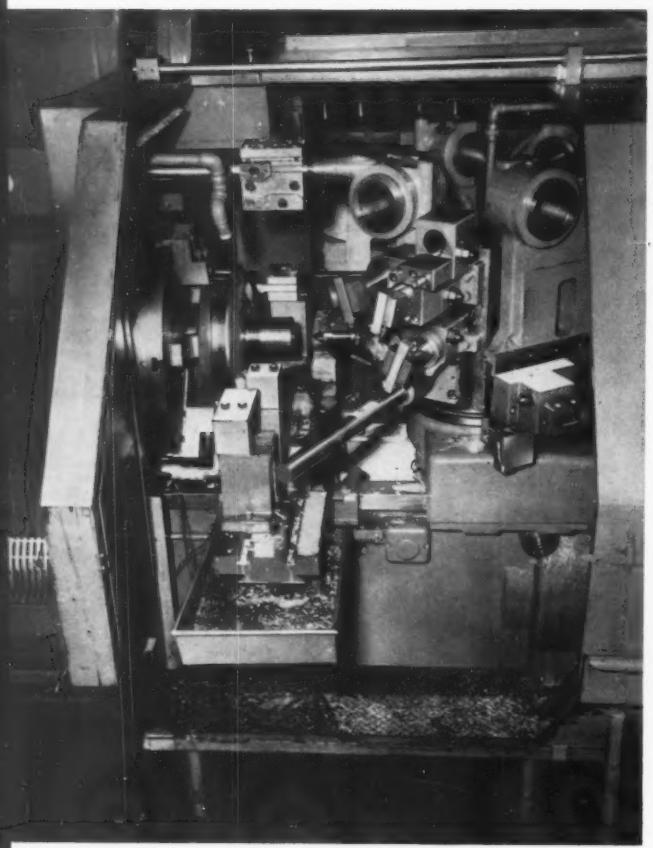
A smaller size Potter & Johnston automatic turret lathe, Fig. 8, machines the internal ring-gear blanks used for the planetary gearing wheel drive arrangement on rear- and bottom-dump earth-moving equipment. The blanks, 18 inches in diameter by 10 inches long, are high-alloy steel forgings having a Brinell hardness of 321. Previously, these parts were done on three different machines requiring more than two hours to complete each part. Now, all operations are completed on two chucking machines in less than one-half hour. Since the machines are automatic cycling, only one operator is required to load and unload both machines.

In the first operation, performed on the machine illustrated, the center of the forged steel gear blank is spot-drilled, drilled through, bored, and reamed. Also, the hub is turned and faced, and the large-diameter flange is faced and partially turned. A portion of the hub is turned to a smaller diameter, and fillets are formed at both ends of this necked-down area by means of a cam-actuated tool mounted on the turret. The cam can be seen mounted on the overhead bar.

On the second automatic turret lathe, the position of the gear blank is reversed, and the bore of the flange is rough- and finish-machined, and chamfered. Also, the inner end of the hub is faced, and an internal groove is cut in the flange bore. Another cam type pusher block is mounted on the overhead bar to cross-feed the facing and grooving tools. Maximum stock removal is about 1/4 inch per side. Cutting speeds are automatically changed in the range of 80 to 300 feet per minute (40 to 209 R.P.M.) during the machining cycle, and the feeds are varied from 0.009 to 0.020 inch per revolution.

Pistons for the hydraulic actuating units are turned and faced on the Sundstrand automatic lathe shown in Fig. 9. The pistons vary from 6 to 10 inches in diameter and from 18 to 40 inches in length. Depth of cut is approximately 3/32 inch, with a cutting speed of 275 feet per minute. Two tungsten-carbide, insert type single-point tools on the front slide complete the rough- and finish-turning, while one tool on the rear slide performs the facing operation—all in one completely automatic cycle. The automatic cycle has resulted in a 75 per cent reduction in production time compared with previous methods. Another 0.025 inch of stock is removed from the parts in a subsequent finish-grinding operation.

The time required to machine the drive wheels for off-the-highway front- and rear-dumps has been cut in half by transferring the operations to Bullard 36-inch vertical turret lathes such as the one shown in Fig. 10. Each machine is equipped with a four-sided, main turret head and an independent side head. A Man-Au-Trol attachment permits completely automatic cycling of the heads through a pre-selected sequence of operations. The pendant control (right) allows the se-



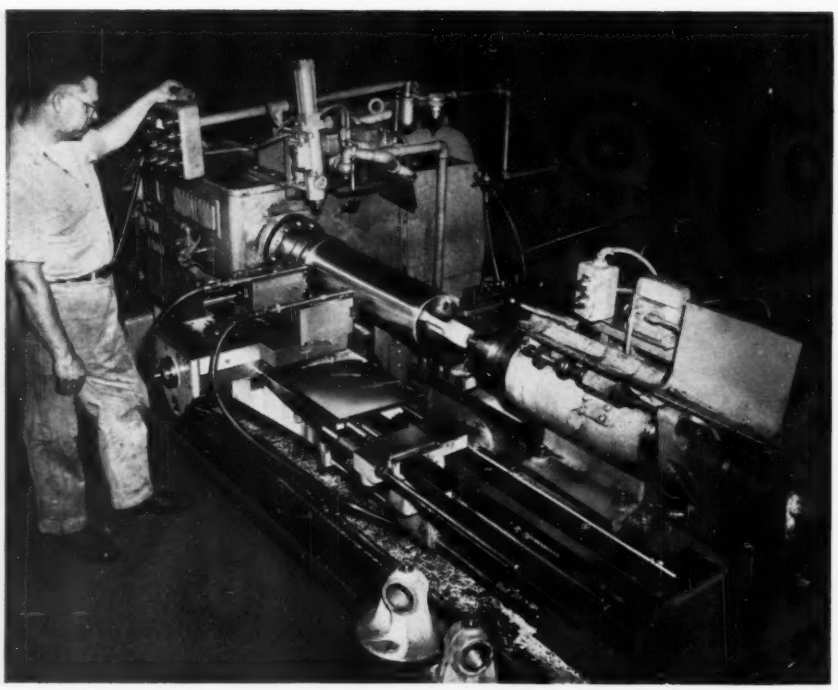
lection of all functions from a central location. Automatic cycling permits one operator to attend two machines.

In the first operation, illustrated, one end of the drive wheel is turned, bored, grooved, faced, and chamfered. The 350-pound wheel, which is approximately 20 inches in diameter by 24 inches wide, is secured to the rotary table of the machine by means of a three-jaw chuck. When completed, the operator inverts the work-piece and mounts it on the second vertical turret lathe. Here, similar operations are performed on the opposite end of the wheel, while another casting is being machined simultaneously on the first machine. Maximum depth of cut is 1/4 inch, and the cutting speeds are varied from 150 to 290 feet per minute by automatically changing the table speeds in the range of 95 to 263 R.P.M. The feed varies from 0.007 to 0.021 inch per revolution.

Pivot arm bores in the rear-axle, tandem drive assembly are rough-, semifinish-, and finish-machined on a Giddings & Lewis horizontal boring, drilling, and milling machine, Fig. 11, having a 48- by 72-inch table, a 120-inch bed length, and 4-inch spindle diameter. Each assembly contains four bores, 6 3/4 inches in diameter and spaced 12 inches apart. While a tolerance of plus or minus 0.001 inch is permitted on the bore diameters, alignment of the four bores with relation to each other must be practically perfect.

Fig. 8. (Above) The time required to machine internal ring-gear blanks has been reduced 75 per cent by performing the operations on automatic turret lathes.

Fig. 9. (Right) Hydraulic pistons varying from 6 to 10 inches in diameter and from 18 to 40 inches in length are turned and faced on this automatic lathe.





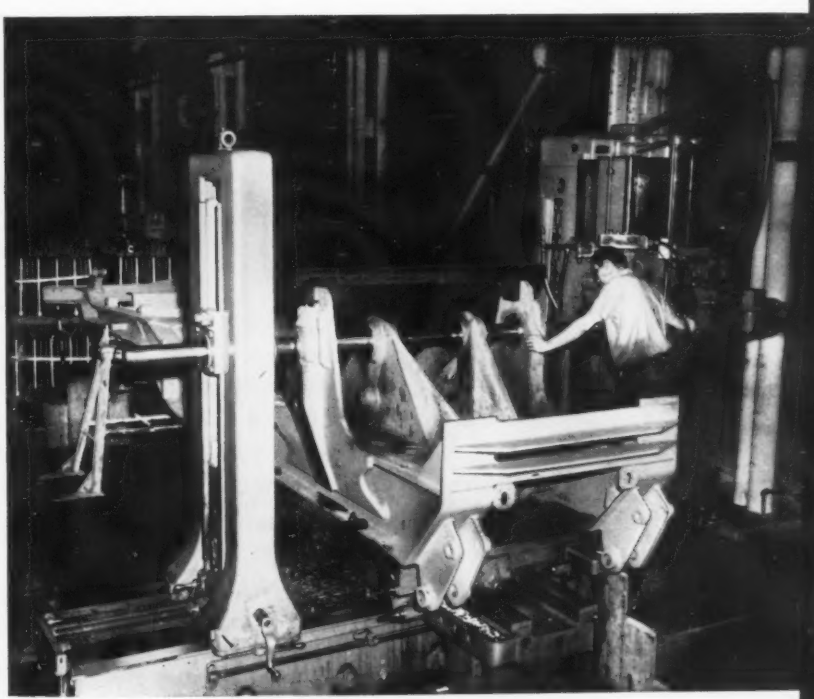
All four holes are rough-bored simultaneously, using double-bladed, high-speed steel tools to remove about 3/8 inch of stock per side. Semi-finish-boring is also performed on all four holes at the same time, removing 3/32 inch more of stock from each hole. However, in finishing only one hole is bored at a time, removing a final 1/32 inch of stock. After finish-boring each hole, a cast-iron pilot bushing is added to support the bar for successive operations. Cutting speeds of 50 feet per minute are used for rough-boring, 60 for semifinishing, and 70 for finishing.

The East Side, St. Clair Plant of Euclid alone uses 25,000 tons of structural steel per year in building rear- and bottom-dump units. While the bulk of this material is hot-rolled mild steel, from 20 to 25 per cent of the total is high-carbon steel. Plate thickness varies from 1/8 to 5 inches.

As can be imagined, a considerable amount of conventional arc welding is required in building earth-moving equipment. Some idea of the amount can be visualized from the fact that the East Side Plant uses over 1,000,000 pounds of welding electrodes per year. In general, AWS Type E-6012 (5/16 inch diameter) and E-6024 (7/32 inch diameter) electrodes are employed. Weld sizes vary from 3/16- to 1- inch fillets, with the average, a 5/16-inch fillet weld. It has been estimated that the welds represent about 1 per cent of the finished product weight.

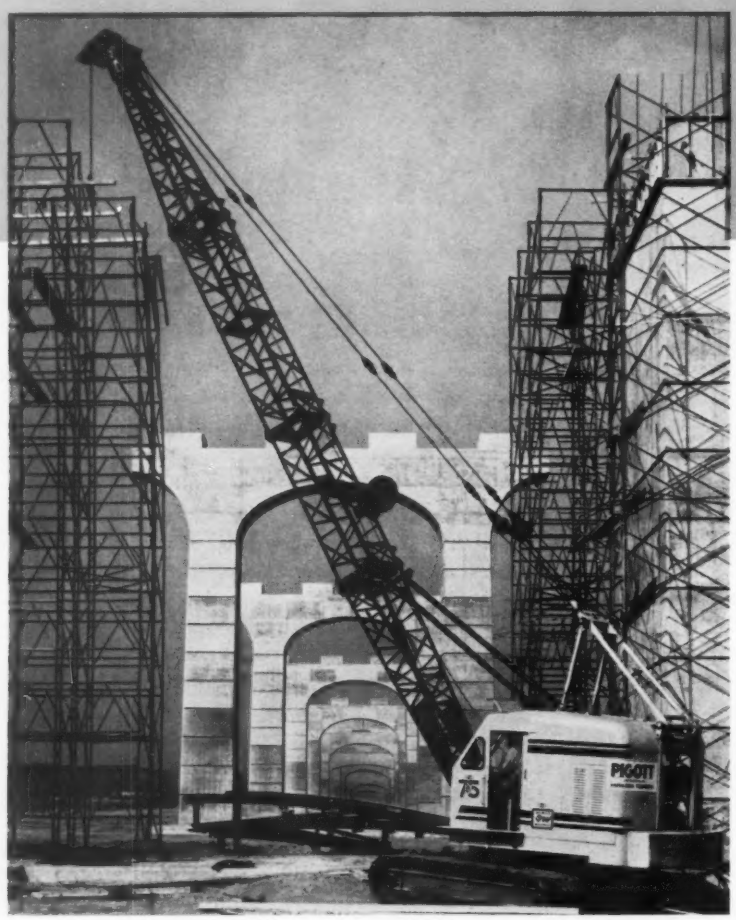
Fig. 10. (Above) Drive wheels for both front- and rear-dump earth-moving units are turned, bored, grooved, faced, and chamfered on this turret lathe.

Fig. 11. (Right) Horizontal boring, drilling, and milling machine being employed to finish four pivot arm bores in a rear-axle, tandem drive assembly



PRODUCING GAR WOOD "BUCKEYE" CONSTRUCTION EQUIPMENT

By JAMES E. DIPERT
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Findlay Division
Gar Wood Industries, Inc.
Findlay, Ohio



Gar Wood Model 75BT, 20-ton truck crane being used in the construction of a modern overhead highway located in Hamilton, Ontario, Canada

Electronically controlled flame-cutting, ingenious forming operations, and unusual welding setups are employed in making ditchers, cranes, shovels, spreaders, graders, and other similar earth-moving equipment.

CONSTRUCTION equipment made by the Findlay Division of Gar Wood Industries includes a complete line of both wheel and ladder type ditchers, truck- and crawler-cranes, crawler-shovels, graders, and spreaders. Also, hydraulic and cable-controlled pusher blade and moldboard attachments for Euclid and Allis-Chalmers crawler tractors are produced.

Output of these units requires the use each month of approximately 25,000 pounds of welding rod, and 350 tons of steel plates, channels, and shafting. Various types of steel including low-carbon, high-carbon, and alloy grades are

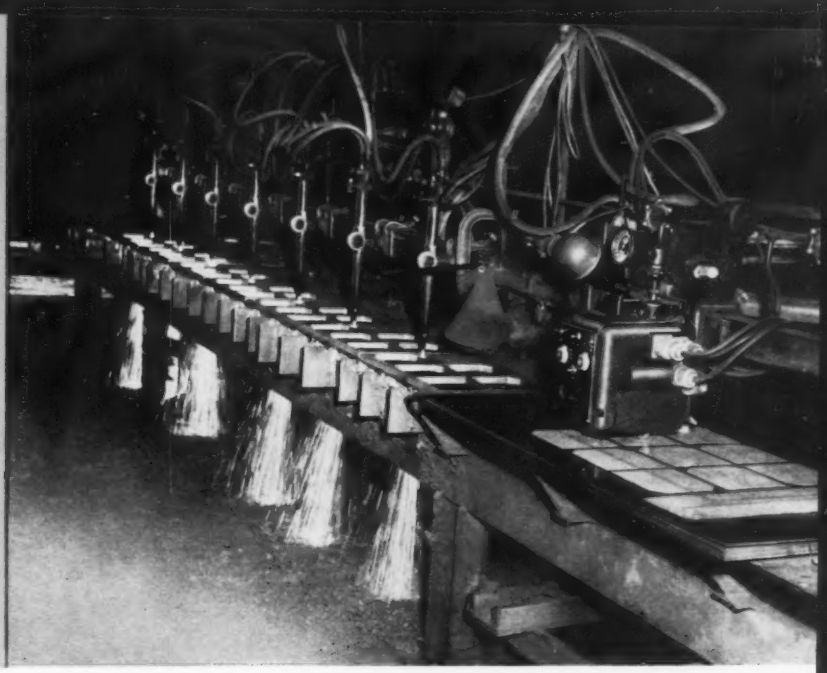


Fig. 1. Automatic setup for flame-cutting of mounting lugs, seven at a time, from 1-inch thick steel plate.

used. Plates up to 4 inches thick, 60 inches wide, and 20 feet long are needed for some of the heavier equipment.

Many parts for the various types of construction equipment are produced directly from steel plate on an Airco pantograph type flame-cutting machine, Fig. 1. This machine can be equipped with as many as eight oxy-acetylene torches and can cut plates up to 4 inches thick. Usually, plates less than 3/16 inch thick are not flame-cut. The rate at which the torches are traversed can be varied from 4 to 30 inches per minute, the higher rates being used for thinner materials.

Electronically Controlled Flame-Cutting Boosts Production

Production obtained in flame-cutting has been boosted as much as 40 per cent and costs have been reduced considerably by providing an electronic tracing device, a close-up view of which is seen in Fig. 2. Previously, a steel template having the exact shape of the parts required had to be made. Then, a tracing wheel was manually guided along the template by the operator. This actuated the machine pantograph assembly, (designed on a one-to-one ratio) which carried the cutting torches, thus producing identical pieces.

Now, with the electronic tracer, low-cost templates are quickly made by cutting them full size from 90-pound white cardboard. These cutouts are placed on a black background and covered with a sheet of Plexiglas, as shown. The electronic tracer consists essentially of a scanning head and a control panel. A variable-speed motor drives the scanning head which is clamped to the operating bar of the machine.

When a beam of light from the optical system of the tracing head is centered, half on the light area of the template and half on the black background, the intensity of the reflected light (when transformed into electrical energy) balances the system and the steering motor is idle. However, if the contour of the template changes, more or less light is reflected, and the steering motor is immediately actuated to relocate the beam on the boundary between template and background. Thus, the scanning head accurately follows the template outline, and the torches duplicate this path to produce the required parts.

With electronic tracer control, it is possible to increase production by a system of "chain" cutting. In this system, the templates are connected by narrow white strips so that the tracer will follow all patterns and produce the parts in one continuous traverse.

Oxygen for flame-cutting is purchased from an outside source and supplied, at a pressure of 150 pounds per square inch, through a 2-inch underground pipe. Acetylene, having a pressure of 25 pounds per square inch, is generated in the plant. The flame-cutting machine is equipped with a table 5 feet wide by 14 feet long. In the setup illustrated, the machine has been fitted with seven torches for flame-cutting mounting lugs from 1-inch thick steel plate.

Roll-Forming of Bucket Mounting Rims for Ditching Machines

Considerable savings have been effected by forming 6-foot diameter rings from bar stock on a Buffalo power-driven bending roll, Fig. 3. This ring, which is used as the bucket mount-

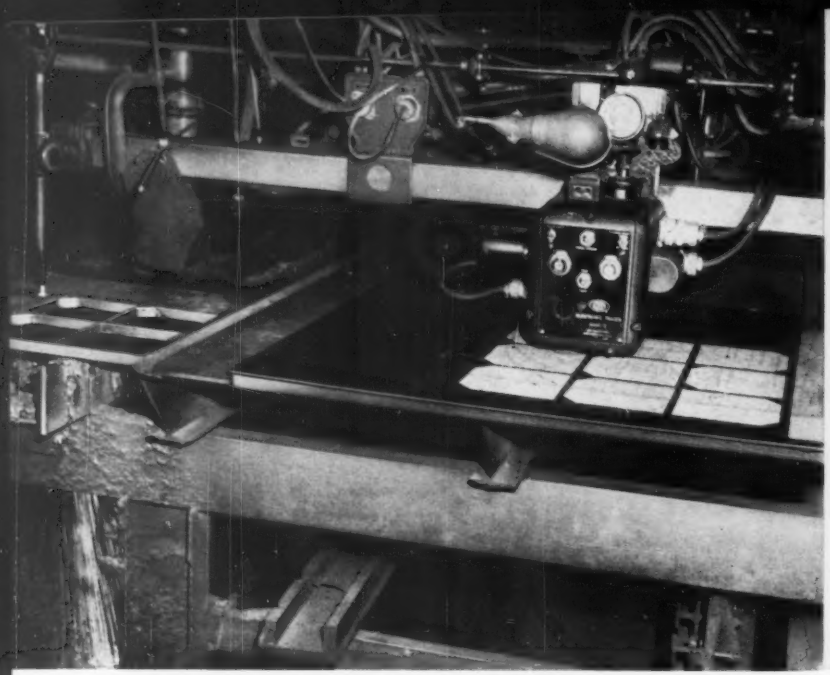


Fig. 2. Close-up view of electronic tracing device on flame-cutting machine seen in Fig. 1. Templates are cut from cardboard.

ing rim on wheel type ditching machines, was previously burned from a 6-foot square plate by means of oxy-acetylene torches. Flame-cutting required four times as long to complete each part and resulted in a substantial waste of material—even though part of the cut-out center disc could be used for other parts. Now, in addition to greatly reduced material requirements, rings of increased structural strength are obtained.

The ditching bucket mounting rims are formed from medium-carbon, hot-rolled steel bars, 6 inches wide by 5/8 inch thick and 22 feet long. This length allows a slight overlap, which is burned off before the ends of the ring are welded together. Bending is done on edge, as shown, in two passes. In the first pass, a partial ring about 7 feet in diameter is formed, and then the rim is completed in the second pass. Since the inner edge of the ring is upset by compressive stresses during bending, it increases in width. For this reason, the bending rolls are provided with adjustable-width slots.

On this pyramid type bending machine, all three rolls are power-driven. The bar is bent by

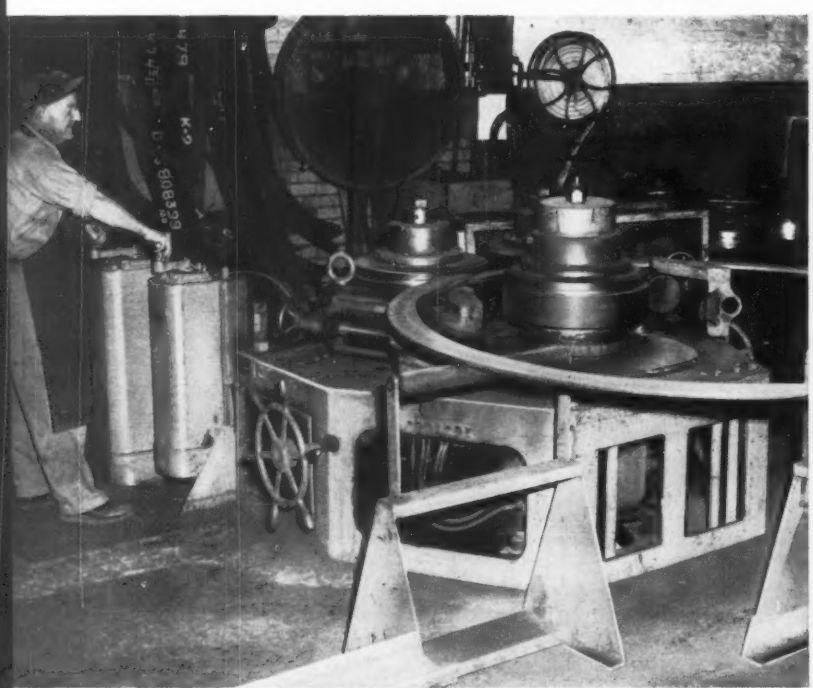


Fig. 3. Power-driven bending roll machine for producing rings 6 feet in diameter from 5/8-inch thick bar stock.

the adjustable-position center roll as the work passes between the two outer rolls. Location of the center roll determines the amount that the bar is deflected and the curvature of the ring formed. This machine is also used to roll-form C-frames for bulldozers from 13-foot lengths of 12-inch by 50-pound channels. The channels are bent both leg-in and leg-out.

Automatic Feeding for Press Brake Forming of Bulldozer Blades

Bulldozer blades for the Euclid TC-12 twin-engine tractor are also made by the Findlay Division of Gar Wood. These blades are approximately 17 feet long by 4 feet wide, and weigh 6600 pounds. Each blade weldment contains about forty parts. The moldboard sheet for the blade is step-braked to the required contour by means of the unique setup illustrated in Fig. 4.

Moldboards start as flat abrasive-resistant, alloy steel plates, 217 inches long and 49 inches wide by 5/8 inch thick. Forming is accomplished on the Dreis & Krump 18-foot, 400-ton press brake shown, by successively bending the plate between the dies as the work is automatically fed in 1-inch increments. Automatic feeding is done by a ratchet and chain arrangement provided on both side frames of the press brake. As the press ram rises (after each bend has been completed), the ratchet wheels are indexed. This pulls the chains secured to both ends of a slotted pipe mounted on one edge of the moldboard

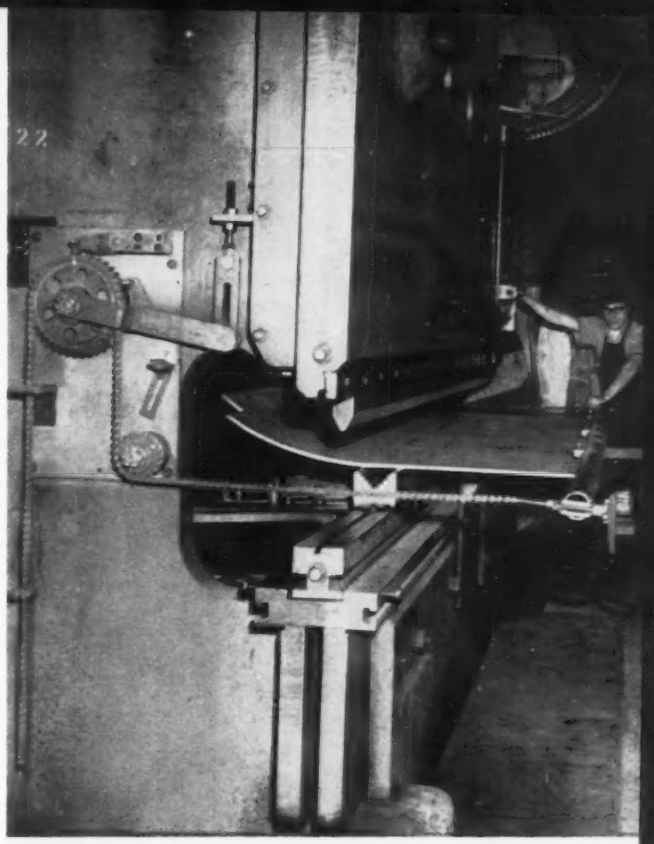


Fig. 4. Moldboards are step-formed to the required contour on this press brake equipped with an automatic feed arrangement.

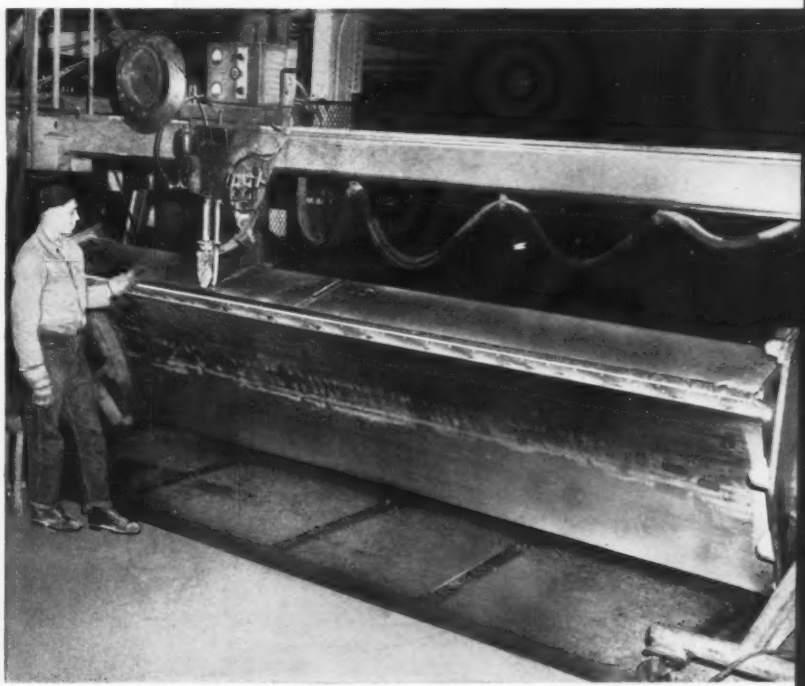


Fig. 5. Fully automatic setup for submerged-arc welding of backup channels to moldboard with 17-foot long seam.

plate, thus pulling the plate further under the brake dies. The radius to which the plate is bent can be changed by adjusting the ram stroke so that the dies will be struck together only the desired amount.

Distortion has been practically eliminated, production costs lowered, and better weld penetration obtained by joining the backup channels to the moldboard with an automatic setup. Fig. 5. The horizontal seam weld (corresponding to a 1/2-inch fillet) more than 17 feet long is completed in one pass, at the rate of 12 inches per minute. A Lincoln Electric submerged-arc welding head is automatically traversed along the machine by a motor-driven traction wheel.

During welding, the moldboard and channel sub-assembly are clamped in trunnion fixtures which permit rotation for positioning. Direct current is supplied from a motor generator set at 1100 amperes and 28 volts. Granular flux and copper-coated, mild steel welding wire, 7/32 inch in diameter, are automatically fed to the weld zone. Used flux is automatically collected and returned to the hopper by a vacuum system.

Squirt Welding Employed in Fabricating Moldboards

Vertical reinforcing ribs are joined to the moldboard by semi-automatic and manual arc welding, as seen in Fig. 6. The work is mounted on a Cullen-Friestedt power-driven positioner. Semi-automatic submerged-arc welding is being done by the operator shown at the top, using manual Lincolnweld machines called "Squirt Welders." Squirt welding combines the advantages of submerged-arc welding with the versatility of the manually held electrode.

Copper-coated mild steel wire, 5/64 inch in diameter, is fed to the work, through a conductor cable and the welding gun, by means of a variable-speed drive motor. Welding for this particu-

Fig. 6. Operator seen at top is using semi-automatic, submerged-arc welding, while operator below is manually arc welding.



Fig. 7. Ferris-wheel fixture for squirt welding of box sections to arch of C-frame. Work-holding plate pivots on fixture shaft.



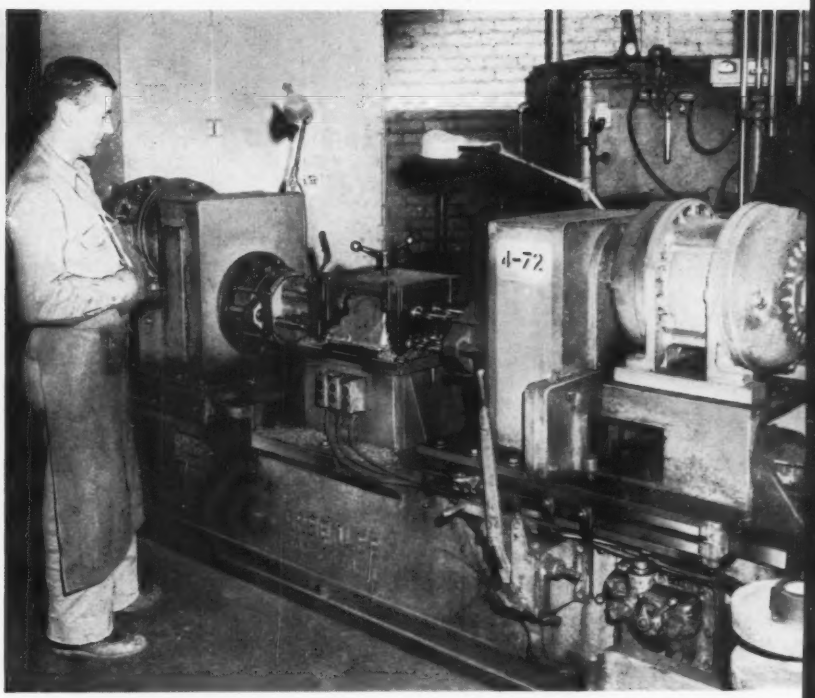


Fig. 8. Opposed-head, hydraulically fed machine for simultaneously drilling fourteen holes in transmission control boxes.

lar operation, which is comparable to a 3/8-inch fillet weld, is performed at 425 amperes and 28 volts. The welding speed depends on the operator, but is generally about 10 inches per minute. Granular flux is gravity fed to the weld zone from the funnel-shaped gun. Semi-automatic welding has resulted in savings up to 50 per cent over manual arc welding. The operator at the bottom is attaching mounting lugs by conventional arc welding.

Another interesting welding setup is illustrated in Fig. 7. Here, a ferris-wheel fixture is being used to position a C-frame during fabrication. The C-frame, used to mount the bulldozer blade on the twin-engine tractor, consists essentially of a right- and left-hand box section and a formed arch. The 8-foot long box sections are each made up of two 12-inch by 50-pound channels and a spacer.

The trunnion type ferris-wheel fixture permits repositioning the work so that welds can be made in a horizontal position. Thus, in joining the box sections to the arch frame, maximum weld strength characteristics are obtained. The work is clamped to a flat plate which fits on the fixture shaft. Here again, Lincoln semi-automatic, submerged-arc squirt welding is used, at 425 amperes and 28 volts, and with 5/64-inch diameter wire.

Control boxes for ditching machine transmissions are drilled, counterbored, and reamed on a Greenlee double-end machine, Fig. 8. The cast-iron control box, 12 inches square by 6 inches high, is manually clamped in the work-holding fixture, and the opposed heads are hydraulically advanced to drill ten holes, 3/4 inch in diameter, and four holes, 1 inch in diameter, simultaneously. When the heads have been automatically retracted, the tools are changed, and the holes are first counterbored and then reamed.



MANUFACTURING TECHNIQUES

Forming of weldments to replace iron castings, squirt welding, and flame-hardening are some of the interesting processes being used to boost the production of large earth-moving and road-building equipment, as well as to improve the quality of the components.

By

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Subsidiary of Westinghouse Air Brake Co.

Peoria, Ill.

A $9,000,000 plant and tooling expansion program has recently been announced by the earth-moving and materials-handling equipment builder LeTourneau-Westinghouse Co. The additional manufacturing space and tools will provide more than double the productive capacity the firm had when it was organized in 1953. A major aspect of the program is a new factory at Peoria, which will contain 300,000 square feet of floor space and be equipped with machine tools having a total cost of $2,500,000. This plant will have complete facilities for producing several sizes of Tournapulls and rubber-tired tractors.

Simultaneously, the company is expanding its plant operations at Toccoa, Ga., and at Indianapolis, Ind. At the latter plant, Adams motor graders, TraveLoaders, and related equipment are manufactured. A 40,000-square-foot building has just been completed at Toccoa, and more than $1,500,000 worth of machine tools and equipment are being ordered to expand production. At the Indianapolis plant, equipment valued at over $1,000,000 is being ordered.

Currently, the output of road-building and

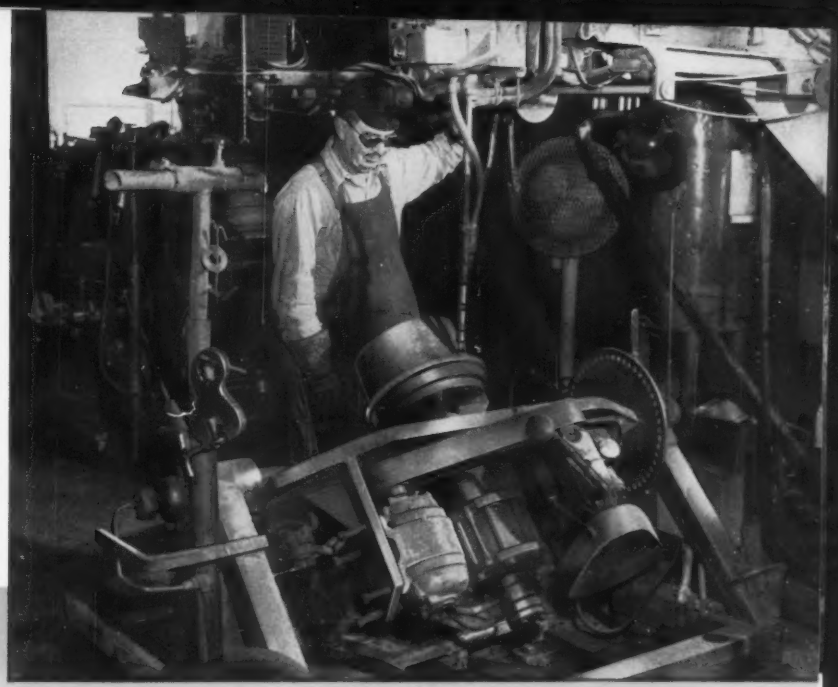


Fig. 1. Automatic submerged-arc welding machine for joining side case to top ring of gear-box. Both inside and outside seam welds are done in same setup.

AT LeTOURNEAU-WESTINGHOUSE

earth-moving equipment is being boosted, and the quality increased, by the development of improved manufacturing processes. For example, better gear-boxes are being produced at less cost by forming them from weldments. Previously, considerable trouble was encountered from leakage due to sand holes and other defects in cast gear-boxes. Now, all such troubles have been eliminated with fabricated boxes that cost about 10 per cent less.

A typical fabricated gear-box, used as a steering reduction unit on small road-building machines and for actuating operating cables on larger equipment, consists of a side case and a top ring. The side case, or band, is made from an SAE 1020 steel plate, 37 1/2 inches long by 6 5/32 inches wide and 3/8 inch thick. The plate is roll-formed to a cylindrical shape having an inside diameter of 11 5/32 inches, and the ends are butt-welded together by means of manual submerged-arc welding. Top rings for the gear-boxes are roll-formed, on edge, from bar stock 3/4 inch thick by 1 5/8 inches wide and 41 3/16 inches long. Flash-welding is employed to join the ring ends.

Side cases and top rings are joined, with both inside and outside seams, on the automatic submerged-arc welding machine seen in Fig. 1. The work is held in a rotary fixture mounted on a universal tilting positioner to facilitate inside and outside seam welding in the same setup. A Lincolnweld submerged-arc welding machine is used for this operation. The inside seam weld (3/16 by 5/16 inch) is completed in one pass at 700 amperes and 30 volts, with a rotary work surface speed of 54 inches per minute. A speed of 59 inches per minute is used for the 1/4-inch outside weld, with a current of 700 amperes and 32 volts. Two passes are made to complete the outside weld.

Welded gear-box assemblies are heated to a temperature of 1900 degrees F. in a gas-fired furnace and placed in a pre-forming machine, Fig. 2. This machine has four sliding jaws equipped with forming dies. Each jaw is closed by toggle action, actuated by an individual 16-inch diameter air cylinder operating at 90 pounds per square inch. The cylinders are mounted vertically in the base of the machine.

While still hot, the gear-boxes are formed to



Fig. 2. Welded gear-boxes are heated to 1900 degrees F. and then pre-formed in this machine. Each of four sliding jaws is actuated by an individual air cylinder.

final size and to the required taper on a 500-ton hydraulic press. The parts are reheated, and the outer contour of the top ring is trimmed to shape. Then, the boxes are restruck in a 250-ton hydraulic press. After welding a base block to each gear-box, the assemblies are normalized, shot-blasted, painted, and machined.

One of the machining operations performed on the gear-boxes is illustrated in Fig. 3. Here, three bearing seats are being bored in the base block on a Warner & Swasey No. 4A turret lathe. Since parallelism of the three bores is of utmost importance, all operations are performed in one setup without rechucking the work. This is accomplished by means of a three-position indexing fixture. The fixture plate, which is mounted in Timken roller bearings, is offset from the center line of the lathe spindle so that when it is rotated the three bores become successively aligned with the turret tooling. An air-operated shot-pin is used to accurately locate the work in each boring position. Air is supplied from a tube running through the lathe spindle, and the control valve is mounted right on the fixture. This

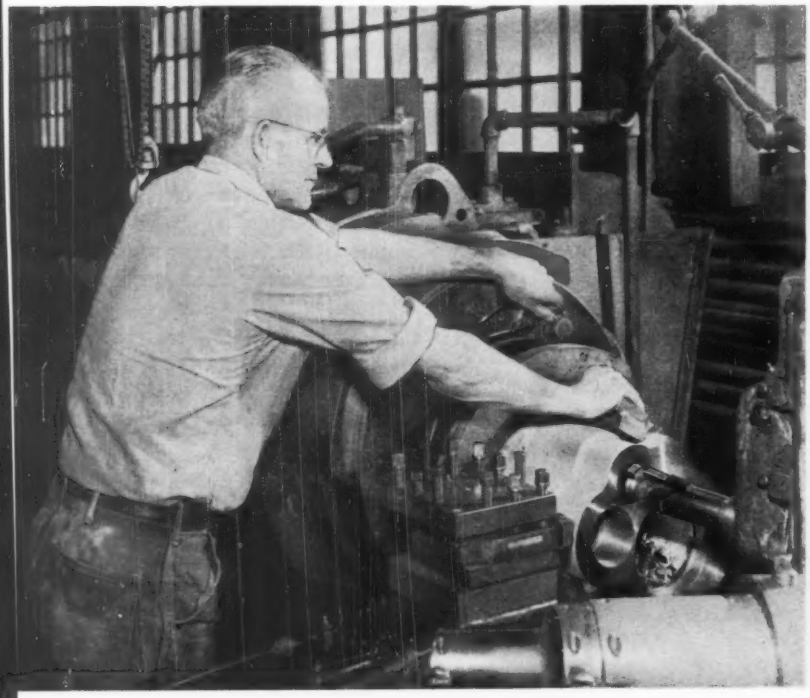


Fig. 3. Three bearing seats in base block of gear-box are bored in one setup on this turret lathe by means of a three-position indexing fixture.

arrangement eliminates the need for providing a separate air line.

To permit rough-, semifinish-, and finish-boring of the bearing seats, each boring-bar on the turret face is slotted to accommodate three high-speed steel tools. The boring tools are located against stops and bolted in place. About 3/8 inch of stock is bored from each bearing seat, maintaining size within plus or minus 0.0007 inch.

Another interesting boring operation is shown in Fig. 4. This special line-boring machine, designed and built by LeTourneau-Westinghouse, is used to bore and face the final drive cases. These cases, 96 inches long by 40 inches wide and 36 inches high, are fabricated by welding together 3-inch thick steel plates. The machine is equipped with two boring-bars, 13 1/2 feet long, each having provision for six block type tools. A dolly (not shown) is provided at the right to support the bars while loading the work, thus permitting shorter ways to be used on the drive end. When the case has been located and clamped, the bars are passed through the holes in the weldment and attached to the tapered seats on the spindles. Floating type key drives are provided to minimize misalignment.

The same four-speed, 40-H.P. motor used on some of the earth-moving units is employed for power, with an infinitely variable, screw type mechanical feed. A center support is included for both boring-bars. Also, the ends of the bars are supported in collet type brass bushings. The pendant seen in the operator's left hand is used to control all motions. A rapid traverse of 30 inches per minute is available in both directions.

A total of eight holes ranging from 6 to 12 inches in diameter and 1 to 1 1/4 inches deep are rough-, semifinish-, and finish-bored in each final drive case—changing the tools between each successive operation. About 9/32 inch of stock is removed in rough- and semifinish-boring, and another 0.030 inch in finish-boring. Also, seven surfaces in each case are faced, removing about 1/8 inch of stock. The carbide boring tools are rotated at cutting speeds varying from 240 to 280 surface feet per minute, and fed at the rate of 0.008 inch per revolution. High-speed steel tools for facing rotate at 80 feet per minute and feed at 0.0025 inch per revolution. A tolerance of plus or minus 0.0006 inch is held on most bores.

Another example of considerable savings resulting from changing to weldments is the production of sheep-foot rollers, which are large drums having numerous feet projecting from their peripheries for tamping or compacting soil. Originally, the 8-inch high feet were one-piece forgings. Now, a saving of about 17 per cent per foot is being realized by welding forged tips to formed pipe bases. Since only the 3-inch diameter forged tips are subject to wear, they are heat-treated. The bases are sawed to length from standard, low-carbon, 5-inch pipe and formed to conical shape on a Niagara 1000-ton mechanical press. Forged tips are joined to the formed bases by manual submerged-arc welding.

The feet sub-assemblies are joined to the roller

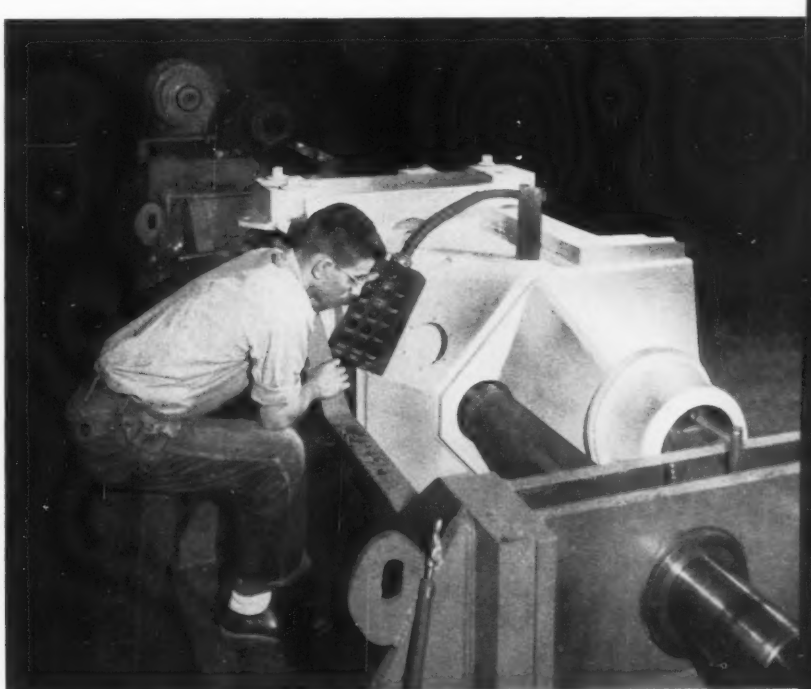


Fig. 4. Special machine for boring eight holes and facing seven surfaces in final drive cases. The bores are 1 to 1 1/4 inches long and 6 to 12 inches in diameter.

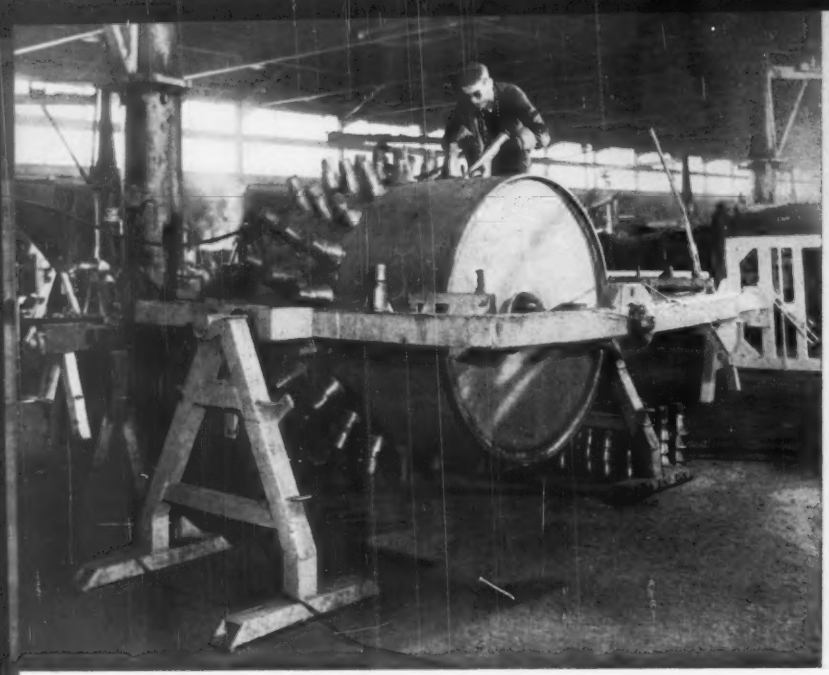


Fig. 5. Squirt welding of feet to roller drums used in compacting soil. Welding is done at 380 amperes and 30 volts, with speed of 12 inches per minute.

drum by semi-automatic submerged-arc welding, using manual Lincolnweld squirt welders, as seen in Fig. 5. Welding is done at 380 amperes and 30 volts, with the 5/16-inch fillet weld being completed in a single pass at a speed of 12 inches per minute. Copper-coated steel wire and granular flux are fed to the weld from the funnel-shaped gun. With this method, the versatility of manual welding is combined with the submerged-arc process.

Squirt welding and conventional manual arc welding are both used in fabricating the huge Model B rear-dump body, Fig. 6. This body, having a 35-ton dirt capacity, is over 15 feet long, 10 feet wide, and 7 feet deep. It is made of 1/2- and 5/8-inch thick steel plates. When assembled to a Tournapull front-end power unit, the rig has an over-all length of 35 feet 10 inches, and a shipping weight of 71,000 pounds.

The rear-dump body is mounted in a jig that is supported in a trunnion type fixture so that it can be rotated to various positions to permit downhand welding. The jig itself is provided with feet to facilitate lowering it onto the floor

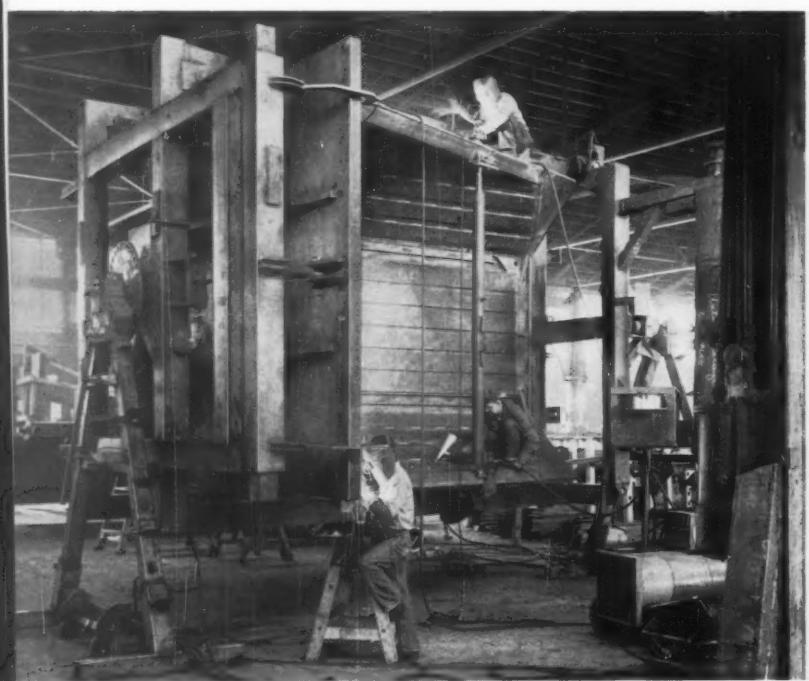


Fig. 6. Huge rear-dump body, 15 feet long by 10 feet wide and 7 feet deep, is mounted in a jig on a trunnion type fixture for repositioning to facilitate the welding operations.



Fig. 7. Interior floor panels of rear-dump body are here being joined by squirt welding. The body is made from steel plates 1/2 and 5/8 inch thick.

when rotation of the body is not required. Fig. 7 illustrates a squirt-welding operation being performed on the interior floor panels of the rear-dump body. About 80 per cent of the welding required on these products is done by the squirt method, and the remainder by conventional arc welding. An interesting design feature is that exhaust gases from the rig's driving engine pass through the false bottom of the body for heating purposes, thus facilitating dumping in the cold.

Helical drive gears for the road-building equipment are made from a modified SAE 1045 steel. The gear blanks are heat-treated, quenched, and tempered to attain a hardness of 33 to 38 Rockwell C prior to machining. After machining, the gear teeth are flame-hardened, Fig. 8, on special machines designed and built by LeTourneau-Westinghouse. A modified flame head containing thirteen oxy-acetylene gas ports is held stationary above the work, while the gear, mounted on an arbor, is reciprocated in a helical path by means of cams. The gear is automatically indexed after each tooth has been hardened.

Depending on the size of the gear being flame-hardened, the top two or three gas ports are plugged to prevent excessive heating of the tops of the teeth. Also, the flame heads are designed so that the teeth roots are not excessively heated. In this way, maximum hardness is produced at the centers of the tooth faces. Surfaces of the teeth attain a temperature of approximately 1525 degrees F., and are immediately quenched by water from twenty-two ports provided directly behind the gas ports. This produces a maximum hardness of 58 Rockwell C to a depth of about 0.085 inch at the pitch diameter of the gear teeth. After flame-hardening, the gears are tempered at a temperature of 300 degrees F.

Fig. 8. Special flame-hardening machine for helical drive gears. Flame head, mounted above work, remains stationary, while gear is reciprocated in helical path.



TALENTED TOOLING AT CATERPILLAR

Outstanding examples of modern machines, unique tooling, and improved manufacturing methods being employed at Caterpillar's expanded facilities for producing diesel engines, track and wheel type tractors, scrapers, motor graders, and other road-building and earth-moving equipment.

By ELLIOT L. BREESE
Manager of Planning
Caterpillar Tractor Co.
Peoria, Ill.

MANUFACTURERS of road-building and earth-moving equipment have never before faced such a tremendous challenge. With the recently passed Federal Aid Highway-Act and the huge state road-building programs, the demand for equipment is skyrocketing. Caterpillar Tractor Co. is facing these opportunities with greatly expanded facilities and many new products that will increase productivity, perform more profitably, and cut maintenance costs.

Starting with the world's first successful track type tractor in 1904, Caterpillar has become one of the largest manufacturers of road-building and earth-moving equipment. Current products include tractors, Traxcavators (tractor shovels), motor graders, scrapers, rippers, pipelayers, bulldozers, and a complete line of diesel engines.

In the ten years following World War II, approximately $200,000,000 was invested in modernizing and enlarging the company's facilities. Early in 1956, it was announced that an additional $200,000,000 was to be allocated in the four years through 1959 for new land, buildings, and equipment.

Cylinder blocks for Caterpillar diesel engines are cast from a medium-high strength, hard gray iron that has higher specifications than ordinary, commercial gray iron. Pan rails, head faces, and the angular and flat surfaces on the right side of



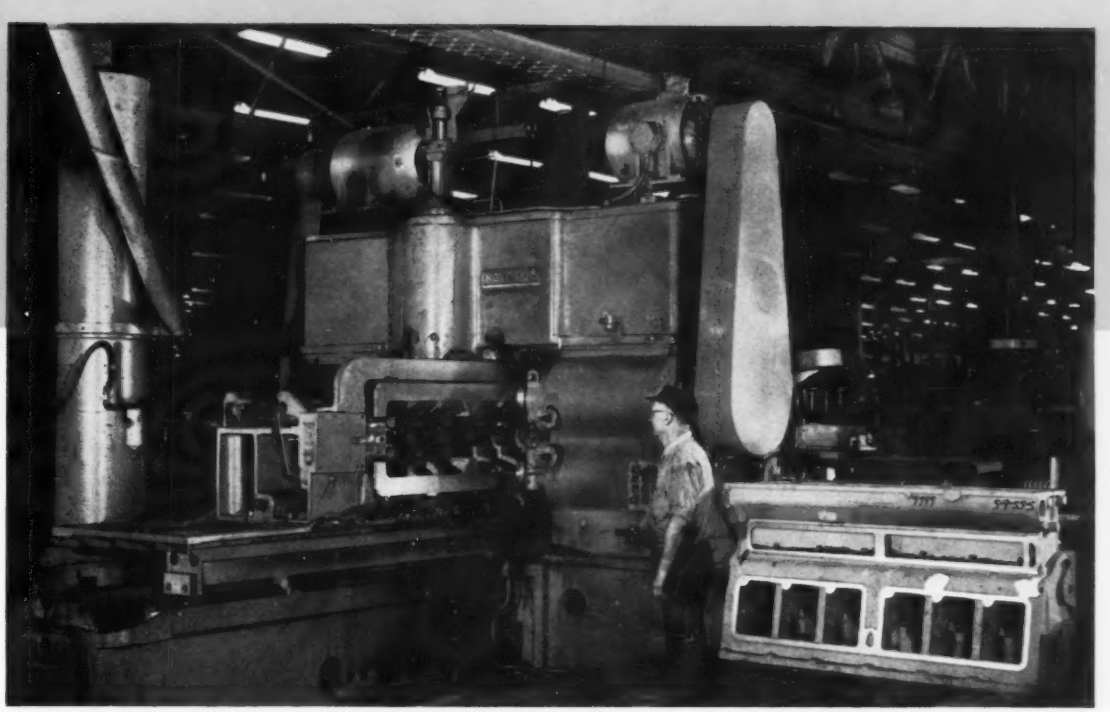


Fig. 1. Seven-spindle, fixed-rail milling machine for simultaneously finishing pan rails, head faces, and angular and flat surfaces on cylinder blocks.

six-cylinder blocks are machined simultaneously on an Ingersoll seven-spindle, fixed-rail milling machine, Fig. 1. The pan rail and head face on each block are rough- and finish-milled in one pass, while the other two surfaces are completed in a single cut.

Castings are loaded by means of an air operated hoist and manually clamped in a work-holding fixture mounted on the 9-foot long table of the machine. This table can be hydraulically fed along the 22-foot long, tubular ways at rates of 9, 14, or 18 inches per minute for rough-milling, and 18, 28, or 36 inches per minute for finishing. Also, a rapid traverse of 300 inches per minute is provided for advancing and retracting the table.

Wings at each side of the machine bed support housings in which the five horizontal cutter spindles are mounted. A top housing, bridging the two side housings, carries a vertical and an angular cutter spindle. The cutters are tungsten-carbide, insert blade type, varying from 6 to 26 inches in diameter, and operate at 200 surface feet per minute for rough-milling and 275 feet per minute for finishing.

As seen in Fig. 2, two horizontal-spindle cutters are provided on the left-hand housing—one for rough- and the other for finish-milling the head face. Two smaller diameter cutters and one larger are mounted on the three right-hand spindles for roughing and finishing the pan face. The angular and vertical spindles in the top housing carry cutters for machining the surfaces on the right side of the block.

All holes in the pan faces of both V-8 and V-12 cylinder blocks are drilled on the huge Natco vertical, multiple-spindle drilling machine shown in Fig. 3. This machine is equipped with a 36-inch wide by 60-inch long rectangular drilling head having a cluster plate provided with 118 joint-and-gear-driven slip type spindles. Independent speed changes are possible for each individual, upper joint drive.

The drilling machine has a two-position, tunnel type fixture arranged to hold either a V-8 or a V-12 block. A total of seventy-eight holes are drilled in the pan face of each V-8 block, while 105 holes are machined in the larger V-12 block. The V-12 blocks measure 36 inches high by 36 inches wide by 71 inches long, and weigh 2800 pounds. To change over from the production of V-12 to V-8 blocks, it is only necessary to alter two stops and remove drills not required.

Cylinder blocks are hydraulically clamped in the drilling fixture by jacking the work-piece upward. Location is against the finished bottom-joint face, over locating pins in the bearing locks, and in contact with one finished end surface. Two passes are made to complete each block. In the

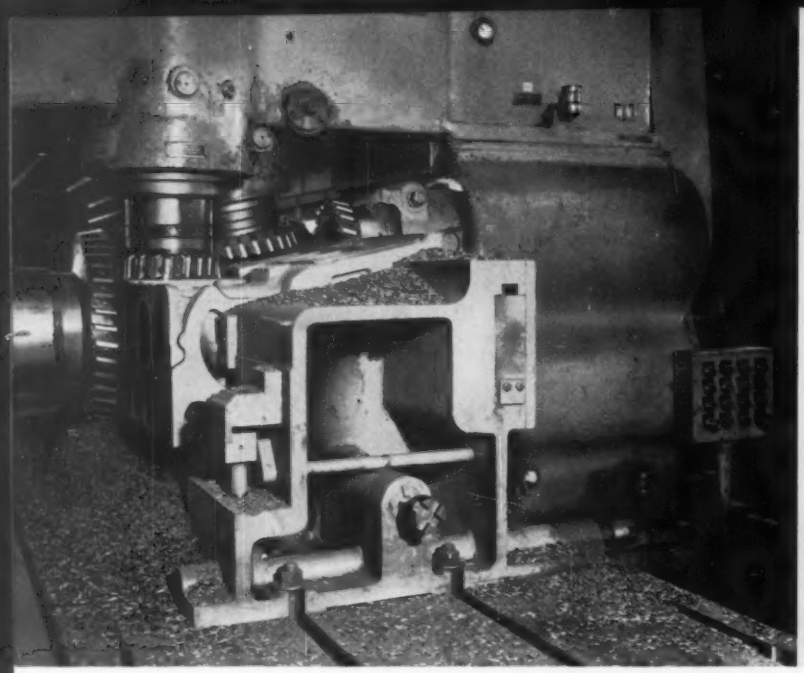


Fig. 2. Close-up view of tooling area on machine seen in Fig. 1. There are two left-hand and three right-hand horizontal spindles, as well as an angular and a vertical spindle.

first pass, half the holes in the pan face are drilled, and the stud holes are counterbored. In the second pass, the stud holes and the remaining holes in the pan face are drilled.

Hole sizes vary form 5/16 inch to 1 1/64 inches in diameter. Two spindle-speed ranges are available—a low range from 79 to 980 R.P.M., and a high range from 143 to 1765 R.P.M. Pick-off gears are employed to change the speed range, and the average cutting speed of the various spindles is 80 surface feet per minute. While the hydraulic feed is variable from 1 to 10 inches per minute, the average rate used is 3 inches per minute. Adjustable trip dogs control the depth of feed, and a feed governor eliminates any jump or surge when the tools break through the work.

Cylinder heads are also cast from the same medium-high strength, hard gray iron as the blocks. Valve guide bushing holes in the heads are finish-bored, and valve insert openings are finish-counterbored on a Heald double-end, six-spindle precision Borematic. Two cylinder heads are loaded into the machine fixture per cycle. Each of the three spindles on one end of the machine carries a carbide boring and a carbide counterboring tool for cutting the six intake valve openings, three at a time. Exhaust valve openings are then bored by the tooling at the other end of the machine after the work-pieces have been indexed 180 degrees. About 0.027 inch of stock is bored from each hole, with the tools rotated at 1600 R.P.M. and fed at the rate of 8 inches per minute. Hole sizes are held to plus or minus 0.0005 inch of the specified sizes.

Cast-iron valve guide bushings, and refrigerated, stainless-steel inserts are pressed into the bored holes. Then, the cylinder heads are hydraulically clamped in the fixture mounted on a second Heald double-end, six-spindle Borematic, Fig. 4. The heads are located from the previously machined intake manifold and end faces.

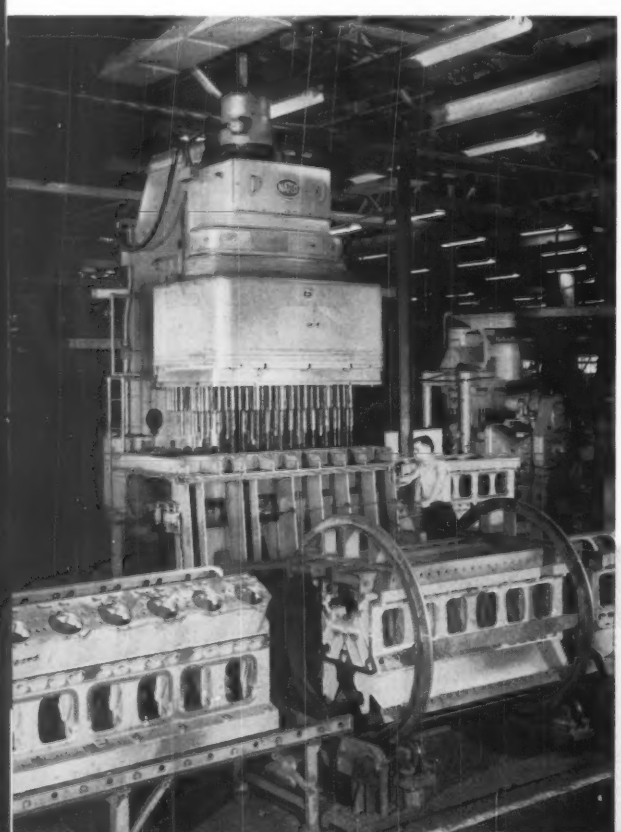


Fig. 3. This vertical, multiple-spindle machine has 118 joint-and-gear-driven, slip type spindles for drilling all holes in the pan faces of V-8 and V-12 blocks.



Fig. 4. Double-end, six-spindle, precision boring machine for cylinder heads. Machines hold two heads at a time, with the work-pieces being clamped by hydraulic means.

In this setup, the valve guide bushings are reamed, and the valve seats are generated. The high-speed steel reamers are rotated at 1200 R.P.M. and hydraulically fed at the rate of 9.6 inches per minute. Single-point carbide bits (mounted in angular boring-tool holders, as seen in Fig. 5, and actuated by cams) are used to generate the valve seats. These tools are rotated at 400 R.P.M. and fed at 1.12 inches per minute.

Diesel engine crankshafts are forged from SAE 1050 steel. The rough forgings are turned, faced, and chamfered on the Wickes double-housing, center-drive, automatic lathe seen in Fig. 6. This heavy-duty crankshaft lathe is equipped with a hydraulic loading and unloading device for positioning the work-pieces, and has a completely automatic machining cycle. The crankshaft is located and driven by the jaws of two center-drive, pot chucks, and supported by live centers of special design on both the movable headstock and tailstock of the lathe. Notches previously milled serve as locating surfaces.

A total of twenty-eight high-speed steel tool bits are mounted in the right- and left-hand and center tool-blocks provided at both the front and rear of the lathe. From 3/16 to 1/4 inch of stock is removed from the various surfaces in turning, cheeking, and forming the fillets on all the main bearing surfaces; turning, facing, and chamfering the flanges and gear mounting surfaces; and turning the oil seal and tapered surfaces. During the machining cycle, the work speed is automatically changed from 18 to 27 R.P.M. Also, the feed rate is varied from 0.027 to 0.018 inch per revolution.

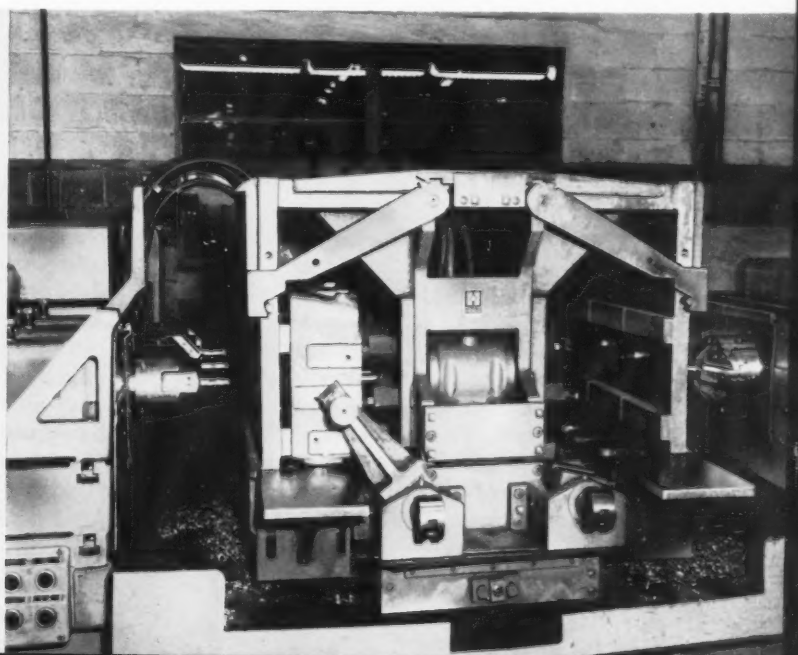


Fig. 5. Single-point, carbide bits are cam-actuated to generate valve seats. A high-speed steel reamer is provided on each spindle to finish the valve guide bushings.

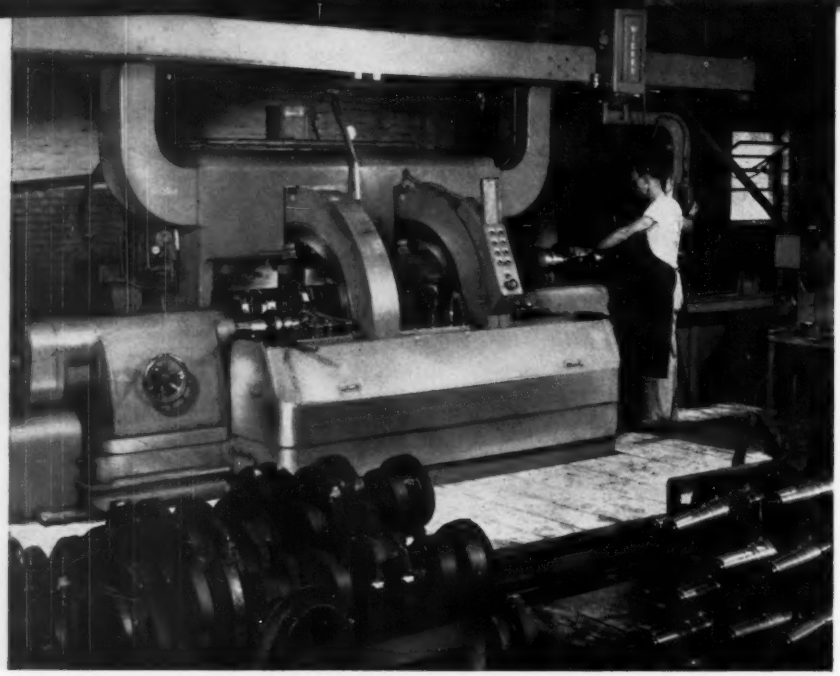


Fig. 6. (Right) Hydraulic loading and unloading is a feature of this double-housing, center-drive lathe for turning, facing, and chamfering the crankshafts.

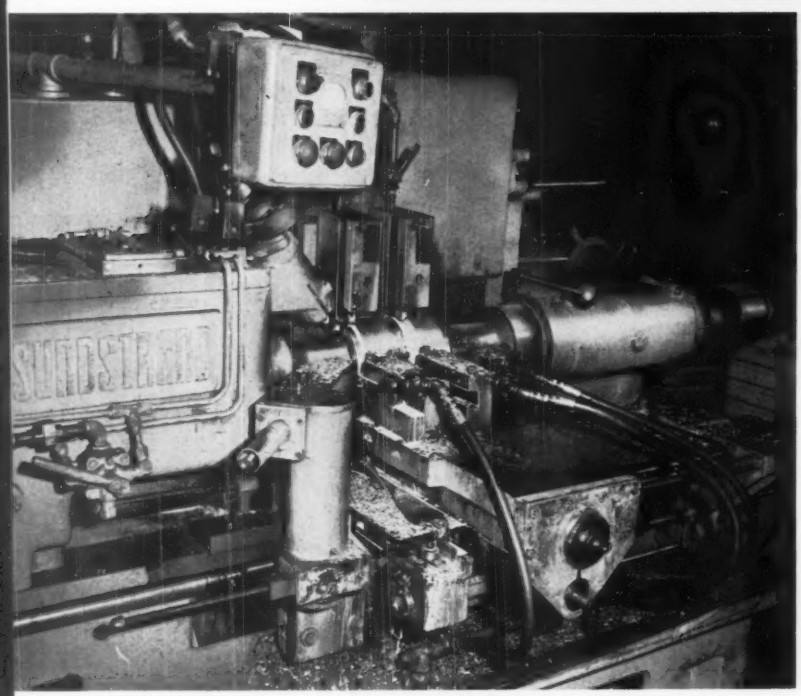


Fig. 7. (Left) Automatic lathe for completely machining track-roller hubs. Rear tools face and chamfer, while front tools turn and chamfer the iron casting.

and, as the diameter being cut becomes smaller, to 0.008 inch per revolution.

Many automatic lathes are used at Caterpillar for machining various tractor and other earth-moving equipment parts. For example, Fig. 7 shows a Sundstrand 12- by 36-inch automatic lathe that is tooled to completely machine cast-iron track-roller hubs. The casting is located from its bore by means of internal expanding jaws mounted on both the headstock and tailstock arbors. Six tungsten-carbide tool bits, secured on a tool-block at the rear of the lathe, are fed transversely to face both ends of the hub, face both sides of a centrally located flange, and chamfer the outer periphery.

A cam-actuated front-mounted tool-block carries four more tungsten-carbide tool bits that rough-turn the flange and periphery of the casting and chamfer one end of the hub bore. Chamfering of the other end of the bore is accomplished with a carbide tool mounted in a special, worm-and-rack-operated side-head that is at an angle of 45 degrees with relation to the work axis. Two tungsten-carbide, round bits are held in a cam-operated overhead tool-holder for finish-turning the track-roller hub periphery.

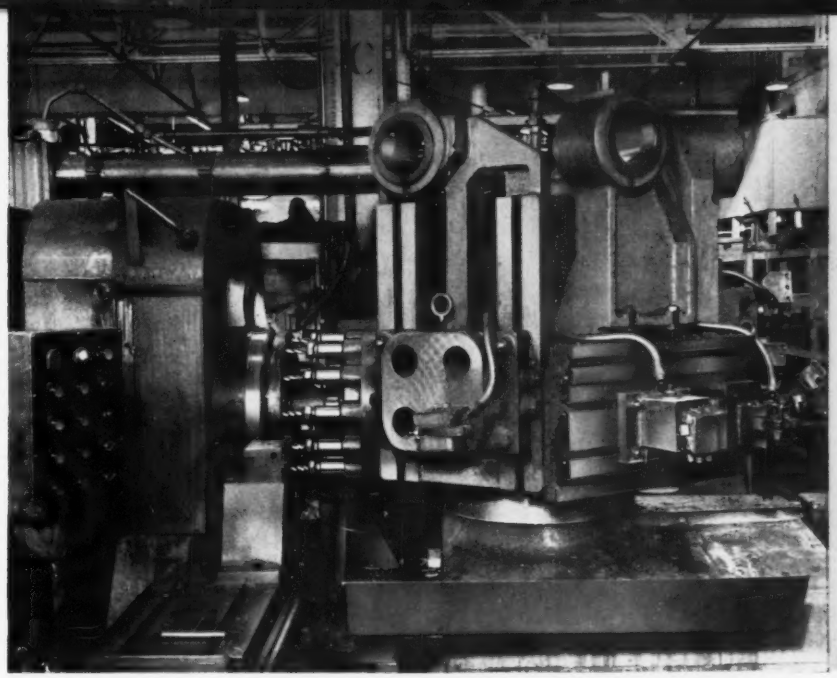


Fig. 8. (Left) Tooling on the turret faces of this automatic chucking lathe includes a twelve-spindle drill head and a bushing plate for drilling steering drums.



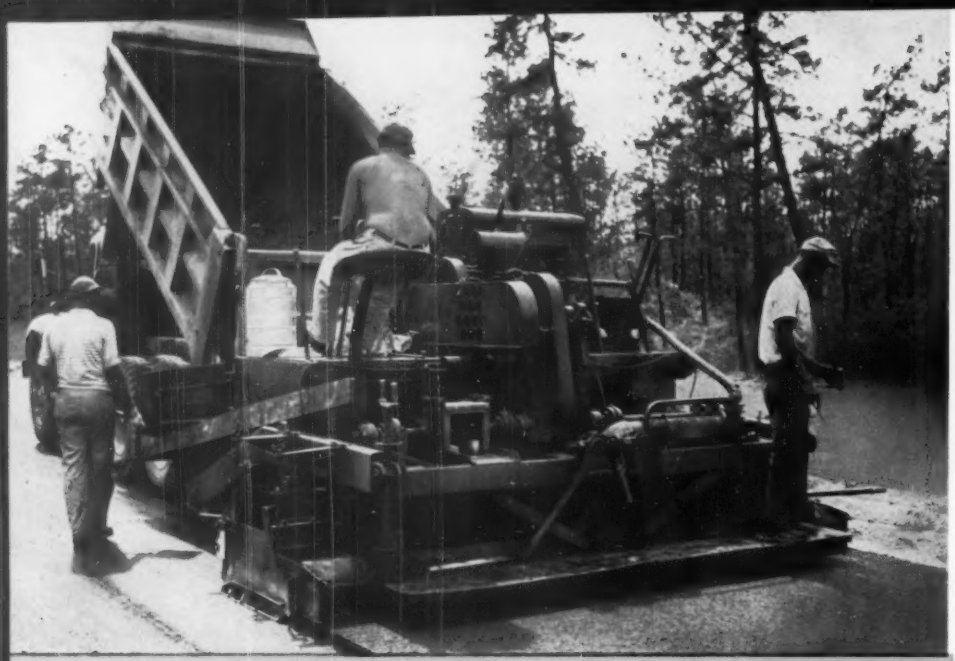
Fig. 9. (Right) Two-column, 15-ton broaching machine for cutting splines in bore of steering clutch drum. Spline teeth have a pitch diameter of 14.875 inches.

Depth of cut is approximately 1/8 inch. The work is rotated at a cutting speed of 275 surface feet per minute. Facing and chamfering tools are fed at the rate of 0.009 inch per revolution, while the turning tools are fed at the rate of 0.030 inch per revolution for roughing and 0.013 inch per revolution for finishing. Specified dimensions are held to a tolerance of plus or minus 0.001 inch.

Driven drums for the steering clutches are iron castings 20 inches in diameter by 8 1/4 inches wide. The drums are completely machined, including turning, boring, facing, chamfering, forming, and drilling, on large Potter & Johnston automatic chucking lathes equipped with turret and cross-slide tooling. A Cushman 30-inch, three-jaw chuck is provided to grip the casting. Two tungsten-carbide tool bits are mounted on the first-position turret face for rough-boring a small hole and rough-turning the periphery of the drum part way. For these operations, the work is rotated at 49 R.P.M. and fed at 0.020 inch per revolution.

A cam-actuated, plunge-cutting attachment is mounted on the second face of the turret to form an under-cut having a 1/8-inch radius. Another tungsten-carbide-tipped tool bit on the turret

(Continued on page 204)



By MYRON GROSS
General Foreman—
Fabricating
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Aurora, Ill.

"BLACK TOP" FINISHERS BEGIN AT BARBER-GREENE

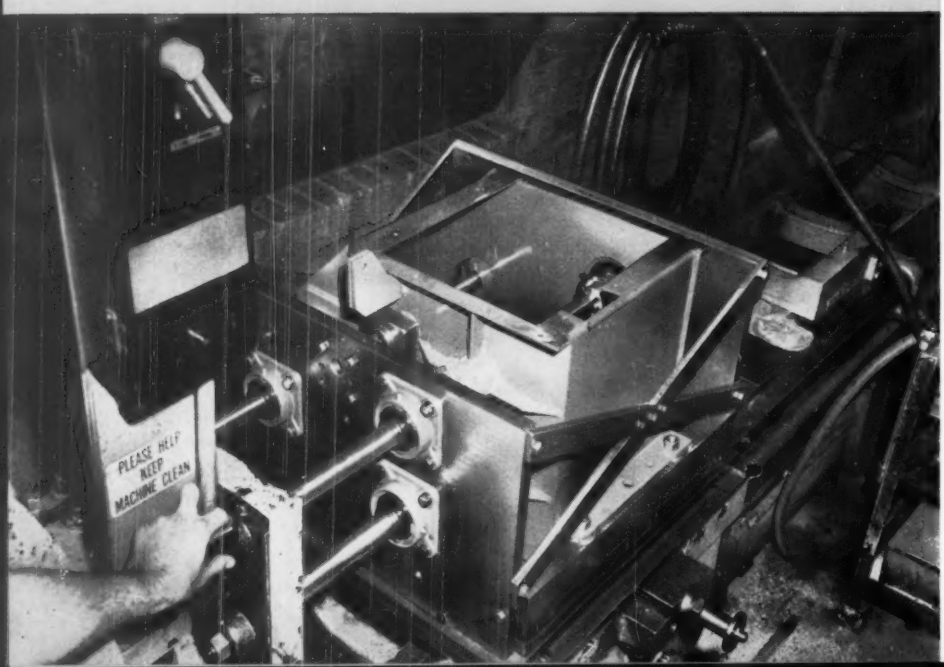


Fig. 1. Line-boring on an engine lathe. The work-fixture is attached to the carriage, and the boring-bars are actuated through a geared head.

A midwestern manufacturer of road-building equipment figuratively leaves imprints in asphalt pavements everywhere—on transcontinental turnpikes, on secondary and tertiary county roads, and on city streets. This busy company turns out, among other products, its famous "black top" finishers and batch type and continuous type plants which prepare and mix the aggregate and bitumen.

QUITE likely, the "black tops" you rode on or walked across today were laid down with equipment made by Barber-Greene, Aurora, Ill. The reason: This company claims about 90 per cent of the bituminous finishing machine business.

One of the finishers is shown at work in the heading illustration. As the equipment moves forward on its crawlers, its hopper is loaded with mix from a dump truck. Once backed into position, the truck is taken out of gear. Rollers on the front of the finisher bear against the rear wheels of the truck, pushing it along while the mix is being dumped into the hopper.

Chain-driven bar feeders carry the mix back to rotating spreading screws, from which it is distributed and deposited on the road. Just behind the screws, a wedge-shaped tamper bar moves vertically, 1500 times a minute, compacting the mat. Backing up the tamper bar is an oil-heated screed which levels and smoothes the material, and controls the thickness of the course. The roadbed is then ready for rolling.

Other equipment made by Barber-Greene directly connected with road-building are complete bituminous plants—both batch type and continuous type. Closely allied products include conveyor systems and loaders for handling the aggregate, and a line of mechanical ditch diggers. A few of the company's interesting manufacturing methods and machines are described here.

In Fig. 1 are shown the line-boring, facing, back-facing, and drilling of the secondary gearbox for the bituminous finisher. This unit transmits power through four clutches to the tamper bar and crawler mechanisms. It is a weldment of 1/4-inch plate, being double thickness in the bore areas. Bores 2 1/16, 2 5/16, and 4 1/4 inches in diameter receive bearing retainers. These are precision-machined castings. A drilled hole is provided for a shifting bar.

The job is handled on an engine lathe, with the work-fixture bolted to the carriage of the machine. Attached to the headstock is a four-spindle geared head. Spindle centers are fixed in the head, according to the required hole location in the work. Both outer sides of the fixture carry pillow-block bearings in which the boring-bars are piloted.

Davis block type boring cutters are used. The cutters are contained in heads which are fastened to the bars after they have been positioned in the fixture. Drilling, boring, and counterboring are performed simultaneously, then the bosses on the left outer side and right inner side of the gear-box are faced. During these operations, the carriage feeds toward the headstock.

For back-facing the left inner side and right outer side, the carriage feed is reversed. The boring-bars fit tapered sockets in the spindles of the geared head. Tapered cross-pins secure the bars in their sockets against working loose from the outward thrust of back-facing.

Strip stock used in conveyor construction is punched and cut to length in the press-brake operation seen in Fig. 2. The material is 3/16 inch thick and 1 1/4 inches wide. In the operation, three oval holes are punched, and the strip is cut off in 2-foot lengths. Two completed pieces can be seen to the right of the operator.

The press brake, an 8-foot Steelweld, is equipped with three Wales-Strippit punching units and a cut-off die. These units have been adapted with protective caps which can be adjusted vertically. A metal template is employed in the setup to locate the punches on the bed of the press brake.

The strip, run through in 20-foot mill lengths, enters the machine from the left, progressing from punching to cut-off positions. After leaving the punching position, the strip is advanced to a stop-pin which engages one of the holes to locate the strip in the cut-off die. At the same time, the strip section previously in location over the



Fig. 2. Steel strip is punched and cut to length on a press brake, a practice well suited to short production runs.

Fig. 3. Core-drilling the pin surfaces of a crawler pad. In the following operation, reamers size the holes.



stop-pin is sheared to length. Thus, a piece is completed each press cycle.

Crawler pads of the bituminous finishing machine are high-carbon steel castings. The inside of each pad forms one half of a hinge at each side, fitting corresponding sections in adjacent pads. A Maxel steel pin enters each joint.

Previously, the pads were assembled in an as-cast condition, the pins running through the rough cores of the hinge sections. To obtain better alignment and increase pin life, these holes are now being machined. The operation can be seen in Fig. 3.

A Barnes upright drill equipped with a two-spindle head machines the two ears on one side of the pad and the single ear on the other side simultaneously. With the pad supported on end in its fixture, three-fluted core-drills first enlarge the holes. Adjustable spiral reamers, automatically fed, then bring the holes to size. As can be seen in the illustration, tools are held in quick-acting chucks. The fixture is rapidly loaded and unloaded by means of a toggle clamp. Subsequently, the pad is heat-treated and shot-blasted, and the holes are wire-brushed.

Gear requirements are met by modern machines like the 36-inch Fellows gear shaper shown in Fig. 4. In this instance, the work-piece is a 10.666-inch, 3-pitch spur gear for the bituminous finisher.

The machine operates as follows: When the drive motor is started, the cutter reciprocates



Fig. 4. Shaping the teeth of a gear for the finisher. The cutter moves up and down, and both cutter and gear blank rotate.

(fifty-nine strokes per minute) and both the cutter and gear begin to rotate. The cutter feeds into the work until a dog trips a limit switch. After one complete rotation of the work, the cutter feeds deeper—this time to the full tooth depth—and a second dog trips another limit switch, the work goes through another complete rotation, and then the machine automatically shuts down. A relieving mechanism retracts the cutter slightly on each up stroke so that it is not dragged over the work. Later, the gear is chamfered, heat-treated, and shot-blasted. Then a short broach is pulled through the bore in order to size it properly.

Sliding gears, like the transmission clusters in the secondary gear-box of the finisher, have their outer tooth faces chamfered for easy engagement. One of the clusters is shown in the process of being chamfered in Fig. 5. The machine tool, built by The Cross Company, utilizes an end-mill type form cutter held in a spindle which automatically rises and falls in time with the movement of the work.

While the work rotates slowly, the cutter,



Fig. 5. The cutter enters the tooth section for chamfering, then rises clear of the gear until the next tooth section is in cutting position.

rotating at high speed, chamfers one side and then the other side of each tooth. The work is held on a tapered mandrel and is positioned radially for the initial cut by means of a pivoting finger. At the start of the cycle, the cutter-spindle is elevated over the gear face. It then lowers hydraulically, and the cutter intersects the path of the teeth. As the spindle descends, one side of the tooth form is chamfered. Then, as the spindle rises, the rotation of the work brings the other side of the tooth form into cutting position. The spindle continues to rise to clear the tooth, and the movements are repeated as the rotation of the work brings the next tooth form into cutting position.

One of several gear-inspecting procedures is illustrated in Fig. 6. Here, a spur gear is revolved in mesh with a master on an Orlandi gear checker. This is a high-production device employing pins and balls to actuate dial indicators. Work loading is rapid, and the inspector has an immediate visual check of pitch diameter, concentricity, size, tooth spacing, backlash, and parallelism.

Welding plays a big role in the manufacture of road-building equipment. The large sizes and heavy wall thicknesses of many structural members favor welded fabrication for the relatively limited quantities produced at any one time. In addition, welded design proves practical for many small parts. In Fig. 7, for example, a hub is being welded to a gear blank.



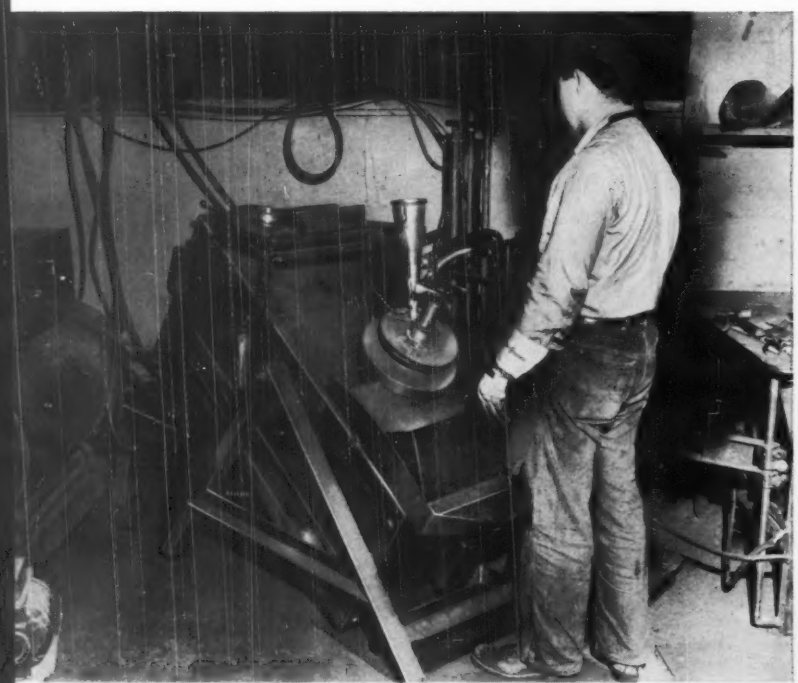


Fig. 6. (Above) The gear to be inspected is rotated in mesh with a master. Dial indicators afford a quick, visual check.

Fig. 7. (Left) When the welding gun is lowered, the arc is struck and the table motor is automatically energized.

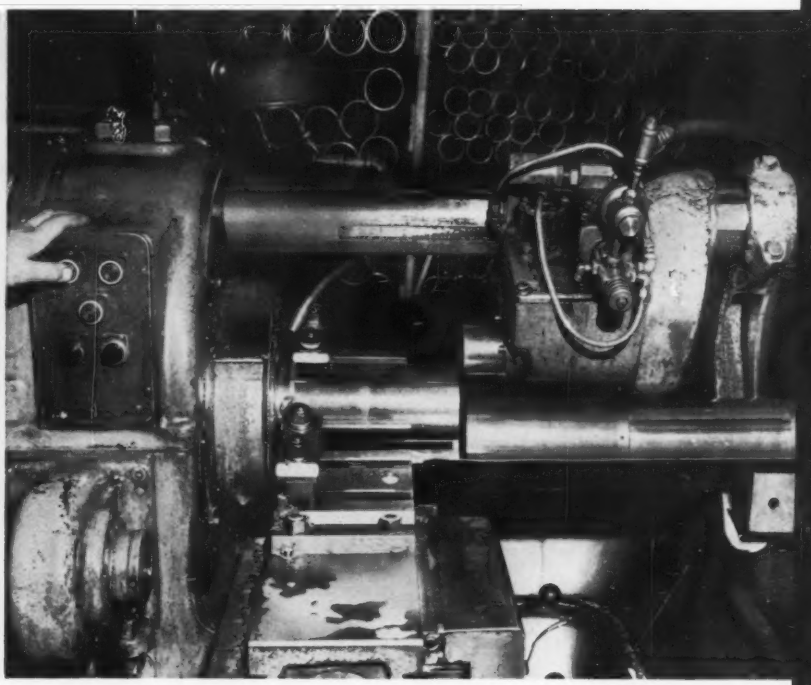


Fig. 8. The positioner on this cutting-off lathe is retracted while the spindle rotates and the cross-slides move in to cut tubing to roller length.

A submerged-arc technique is employed. The welding positioner supports the work at a 45-degree angle, and rotates it automatically 360 degrees. Lincoln equipment is used. The gun is a funnel-shaped dispenser containing granulated flux, with an insulated nozzle through which bare electrode wire is fed.

The gun is mounted on an arm which is electrically interlocked with the rotation of the work. To load and unload the work, the arm is tilted up. When ready to weld, the arm is lowered, the arc is struck automatically, and the table motor is energized.

Rollers for aggregate loaders and other conveying machinery are among the few items that are mass-produced. An early step in their manufacture appears in Fig. 8. Here, tubing is cut to roller length on a Bardons & Oliver cutting-off lathe. The machine tool has two hydraulically fed slides and functions entirely automatically.

Stock is fed through an air-operated chuck until it abuts a positioner suspended from an overarm in the headstock. The chuck then closes, and the positioner, also air-operated, retracts out of contact with the work. As the spindle revolves, front and rear cross-slides move inward. Cutting-off tools are carried on each cross-slide and are aligned to produce a single kerf.





Fig. 1. Fabricating the main boom section. After being tack welded, three boom pipes and three side-plates are permanently joined by automatic submerged-arc seam welding.

ACCELERATED construction of new highway systems together with a stepped-up program of repairing and modernizing existing roads has given impetus to the expansion of facilities for producing varied types of earth-moving equipment in this country. One company presently involved in such an expansion program is the Warner & Swasey Co. At its New Philadelphia, Ohio, plant, where the Gradall multiple-purpose construction machine is manufactured, plant capacity will be stepped up 25 per cent. A portion of this increase will be utilized by the company's Machine Tool Products Division with emphasis on the production of parts for precision earth-moving machinery.

Through the use of fully hydraulic operation and control, gears, clutches, and cable drums have been eliminated in the design of the Gradall. Although five models of this equipment are being manufactured, the upper structures of all are basically the same—the difference lying in the type of carrier provided. There is a standard unit with either a 6 by 6 or a 6 by 4 drive for fast "between job" moves; a self-propelled version for yard work that can be driven at speeds up to five miles per hour; and a crawler-mounted unit. The hydraulic pressure used to actuate the boom is also used to power the crawler drive system. A special heavy-duty carrier is used for railroad right-of-way operations and can be provided with two pairs of guide wheels—one pair located ahead of the front wheels and one pair behind the rear wheels to engage the track rails when desired.

Five controls give positive command of the machine's "arm-action" boom. These five movements are boom swing; raise and lower; in and out; tilt; and attachment, or tool, control. Each movement is controlled by a complete hydraulic

MECHANICAL ARM REACHES OUT TO BUILD HIGHWAYS

A hydraulically actuated telescoping boom is the unique feature of the Gradall earth-moving and construction machine. This mechanical arm can duplicate most all of the movements possible with the human arm. Submerged-arc welding, precision machining, and electronically controlled flame-cutting are among the diverse operations necessary to produce this mobile equipment.

By RAYMOND H. SPIOTTA, Associate Editor

circuit. Cycle time is minimized by a three-unit pump that permits three circuits to be employed simultaneously. The circuits consist of an oil reservoir, the three-unit tandem pump, a manifold that houses safety relief valves, and control valves that direct the flow of oil to a total of seven boom-control cylinders.

Two sections, one inside the other, make up the boom. A double-acting cylinder inside the unit controls the telescoping action. The outer boom is welded to a continuous ring which rides on rollers inside the yoke of a heavy cradle. This mounting enables the boom to be tilted 45 degrees either side of center by means of a hydraulic cylinder at its back end. One cylinder on each side of the cradle raises and lowers the boom and holds it in any position. Positive control of attachments through an arc of 116 degrees is made possible by a cylinder at the front end of the inner boom section.

To fabricate the main boom section, three sideplates and three main boom pipes are located in a welding fixture and joined by a series of tack welds. The rigid unit is then supported on a positioner that permits rotation about the longitudinal axis of the weldment. Rails embedded in the floor support both ends of the positioner which is rolled into place beneath the head of an automatic Lincoln submerged-arc seam welding machine, Fig. 1. A total of six 1/4-inch fillet welds are made, one on each side of the boom pipes.

It would appear from the illustration that the seam is being laid between two boom pipes. This is not the case. The metal strip shown alongside the pipe is actually an angle-iron that is clamped in place to prevent the excess flux granules from pouring onto the floor.

Cold-drawn mechanical seamless tubing of AISI C1015 steel, having an initial outside diameter of 4 1/4 inches and an inside diameter of 3 1/4 inches, is used to form the larger half of a two-section plunger for the double-acting main boom cylinder. Before any work is done on the lengths of tubing they undergo a thorough steam cleaning. They are then placed on a K. R. Wilson hydraulic press to be straightened within a limit of 0.010 inch in any 3 feet.

The outer surface of the plunger is turned to a diameter of 4.018 to 4.023 inches on a Springfield engine lathe, Fig. 2. One end of the part is held in a chuck, while the opposite end is supported on a company-built live tailstock center. A follower-rest on the carriage contacts the work behind the cutting tool.

After being straightened once again, but this time to a limit of 0.005 inch in any 3 feet, the plunger is ground to an outside diameter of 3.996 to 3.998 inches on a specially built Cincinnati centerless grinding machine. The surface is buffed and given a bright chrome-plating 0.0005 inch thick. A final buffing is given the outer surface and it is checked to a maximum roughness of 20 micro-inches. Such a check, made on the piston-rod for a tool-actuating cylinder that requires the same surface finish, can be seen in Fig. 3. Although a reading of 20 micro-inches is acceptable, the Profilometer indicates a surface roughness of 12 micro-inches for the part illustrated.

A turntable of cast SAE 4135 steel, having a continuous circular path for eight double-mounted bogie rollers, supports the entire weight of the Gradall upper structure. The bottoms of four mounting pads are machined on a Lucas

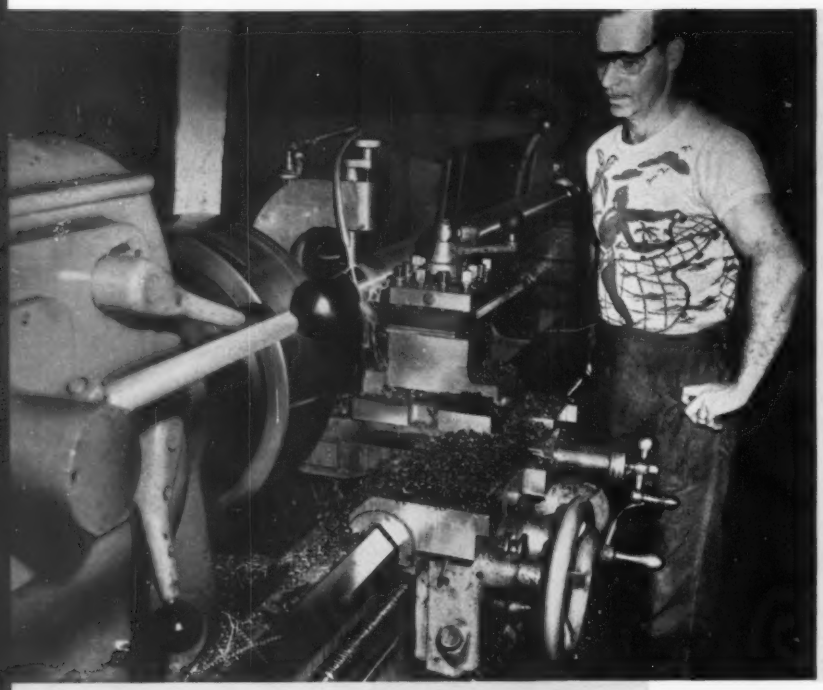


Fig. 2. Turning the periphery of the larger section of a two-section plunger for a double-acting main boom cylinder. After straightening, grinding, and buffing, the plunger is chrome-plated.

Fig. 3. Checking the surface roughness of a piston-rod for a tool-actuating cylinder. After chrome-plating and buffing, a surface roughness of 20 micro-inches is the maximum acceptable.



horizontal boring mill, as can be seen in Fig. 4, with the casting clamped against a right-angle plate. An 8-inch diameter face-milling cutter with inserted carbide teeth is used.

After twelve 1 5/32-inch diameter holes are drilled and spot-faced in the mounting pads (three in each pad) on a Cincinnati Bickford 6-foot radial drilling machine, the 1400-pound roller-path casting is secured to the table of a 64-inch Bullard vertical turret lathe by four table jaws and four sets of clamps. First the sides and bottom of the V-shaped roller path are turned. Two cuts are taken on each track face, one roughing and one finishing. The tapered cuts are held to an angle of 7 degrees 5 minutes (plus or minus 5 minutes) by means of an angular turning attachment applied to the handwheel unit of the turret head. A dimension of 6 1/64 inches, plus 0.000 minus 0.010-inch, is held across the mouth of the vee.

The next cut finishes the 48-inch outside diameter of the V-groove. This is followed by the turning and facing of two hubs extending upward from the top of the casting as can be seen in Fig. 5. A 1/8-inch by 45-degree chamfer is cut on the larger hub, and a 5/8-inch radius is formed at the top of the smaller hub.

Both track surfaces of the roller path are hardened to 500 Brinell. This operation is performed on a company-built flame-hardening machine as shown in Fig. 6. The casting is mounted on a rotary table and is fed past a stationary multiple-jet nozzle. Immediately behind the gas nozzle

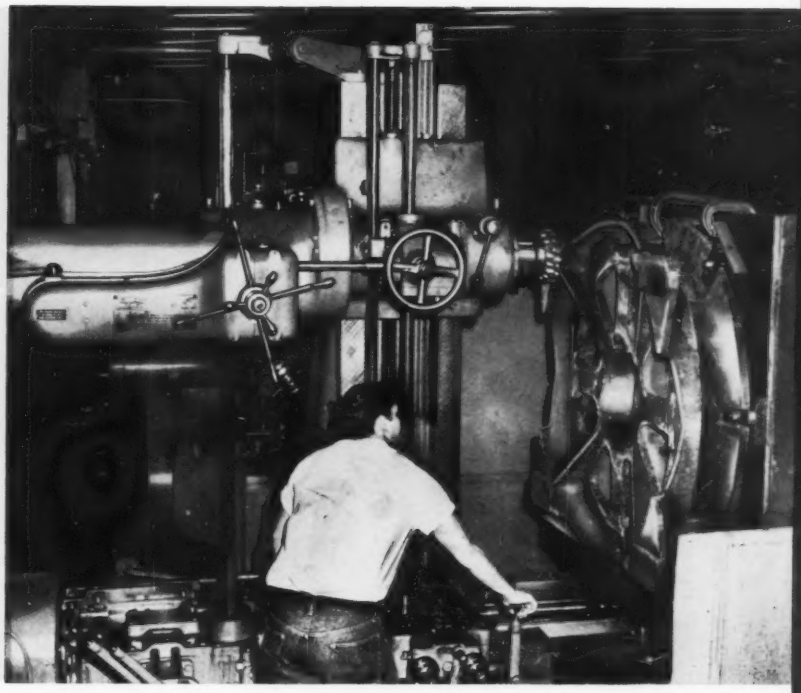


Fig. 4. Face-milling the bottom surface of four mounting pads on a steel roller-path casting, using an 8-inch diameter cutter. These pads are employed as locating surfaces in subsequent operations.

are two sprinkler heads that direct streams of water at both the heated track face and the upper surface of the flange.

It can be seen that only one track face is hardened in a single setting. To finish the second track face the multiple-jet nozzle is reversed. Total elapsed time for this operation, which includes handling time, reversing time, and heat-treating time, is fifty-five minutes.

Tapered bogie rollers that ride in the roller path are machined from 6 1/4-inch diameter bars of AISI 4150 (resulphurized 0.06 to 0.10 per cent) hot-rolled steel. The 6-inch diameter bore in the chuck on the Warner & Swasey 3-A saddle type turret lathe shown in Fig. 7 was opened up to 6 1/2 inches in diameter to accommodate the bars.

A starting drill is fed into the end of the bar, followed by a 2 3/4-inch diameter drill to rough-form a bearing hole in the center of the part. The hole is then rough- and finish-bored from the hexagonal turret to a diameter of 2.860 to 2.862 inches. Speeds and feeds are changed from 228 R.P.M. with a 0.015 inch per revolution feed rate when rough-boring to 456 R.P.M. and 0.012 inch per revolution when finish-boring. After boring,

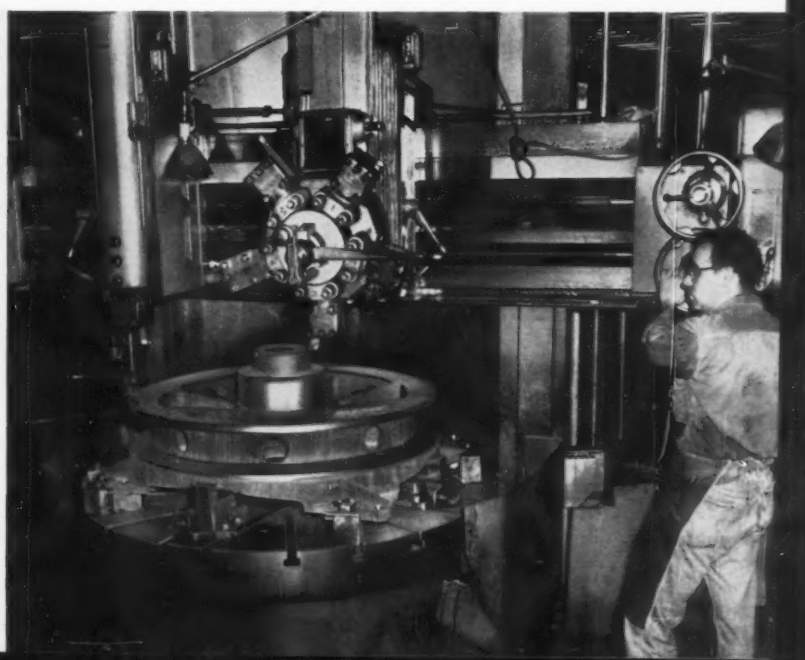
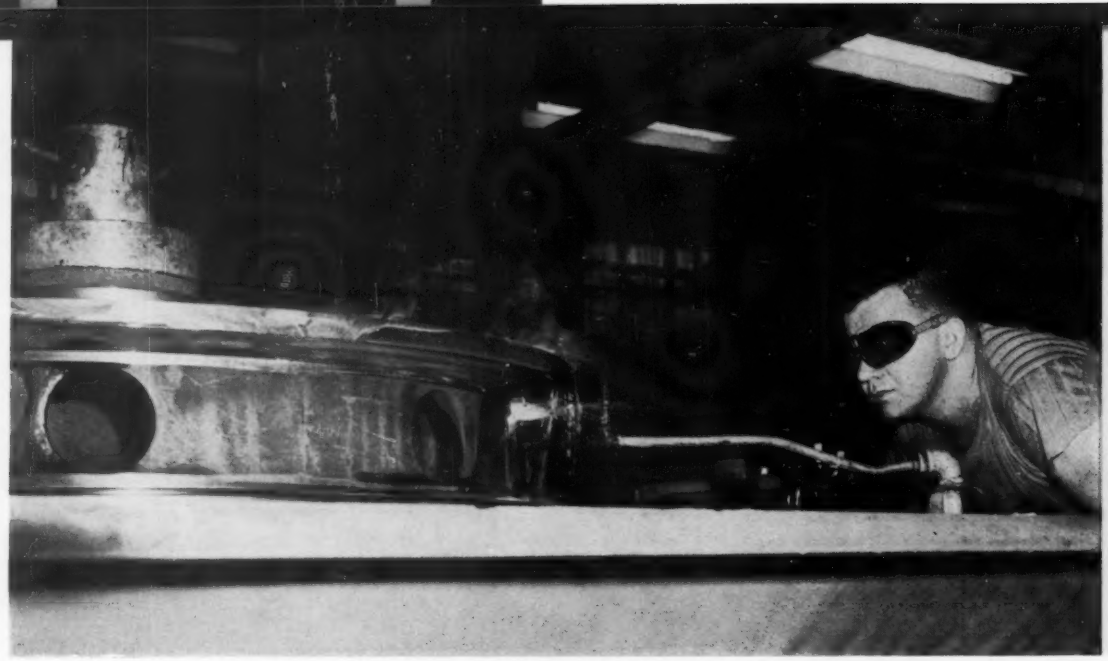


Fig. 5. A circular V-shaped roller path and mounting hubs for a sprocket wheel are turned on this 1400-pound roller-path casting. The tapered cuts are held to plus or minus 5 minutes.



a 3 1/32-inch diameter counterbore is cut 0.151 to 0.156 inch deep.

From the square turret a taper of 14 degrees 10 minutes (plus or minus 10 minutes) is rough- and finish-turned on the periphery of the work to a large-end diameter of 6.000 to 6.005 inches. The taper is rough-turned at 106 R.P.M. with a feed of 0.0167 inch per revolution (at the same time that the previously mentioned 2 3/4-inch diameter drill is fed in at 0.009 inch per revolution) and is finished at 228 R.P.M. with a feed of 0.020 inch per revolution (in combination with the rough-boring). A relief taper is turned at the large end of the work 0.007 inch deep and extending back along the part for 1 1/4 inches.

A tool on the square turret takes a facing cut on the end of the work and also cuts a 3/32-inch by 45-degree chamfer on the edge of the part. A 1/8-inch radius is shaped on the cut-off end of the work-piece by a form tool mounted on the hexagonal turret (in combination with the cut-off operation). The 2 3/4-inch diameter drill used to rough out the center hole is reinserted in the hole to catch the finished part while a cut-off tool on the square turret is fed in from the side. During the initial portion of the cut, the lathe is operated at 72 R.P.M. with a feed of 0.0062 inch per revolution—the remaining part of the cut being taken at 93 R.P.M. with the feed unchanged.

The rollers are brought to a hardness ranging from 418 to 444 Brinell by heat-treating in an Ipsen furnace. After heat-treating, the large face is ground to a roller length of 2.995 to 3.005 inches. Also, the bore is ground to a diameter of 2.8750 to 2.8765 inches.

Bogie rollers are not the only parts that must undergo heat-treating operations. Others are eccentric shafts that mount the eight adjustable rollers supporting the main boom section. These shafts are machined two at a time as one piece from 1 7/8-inch diameter bars of AISI 4615 steel. After the eccentric shafts have been turned, two flats milled, the parts straightened, and serrations at the ends hobbed, they are carburized in a Hevi Duty pit type gas furnace.

When the parts have cooled, they are necked, chamfered, and drilled and have grease grooves milled lengthwise along the offset diameters. They are then placed in a Lindberg hardening furnace, twenty-four at a time. The parts remain in the furnace at a temperature of 1420 degrees F. in an endothermic atmosphere for a period of one hour. An oil quench is used.

A tempering operation follows, in which the shafts are placed in another Lindberg furnace and held for one hour at a temperature of 375 degrees F. In this case they are cooled in air, resulting in a hardness ranging from 58 to 62 Rockwell C. Each end of the two-ended shaft is dipped 1/4 inch deep into a pot of molten lead held at a temperature of 1200 degrees F. to draw these areas to 24 to 26 Rockwell C. Close-tolerance diameters are then ground, the part cut in half to form two identical shafts, and the grease holes drilled and tapped to finish the part.

Twenty attachments for the Gradall give it a wide job range. Attachments such as trenching and excavating buckets and pavement removal buckets are subject to severe wear on their outer surfaces, due to scraping action encountered in normal use. As a buffer against this condition, wear strips are welded to these areas.

These wear strips are flame-cut from 1/2-inch thick steel plates on an Airco pantograph type oxy-acetylene machine, Fig. 8. Five torches are mounted on the operating bar and cut eighteen strips across the width of the plate in groups of

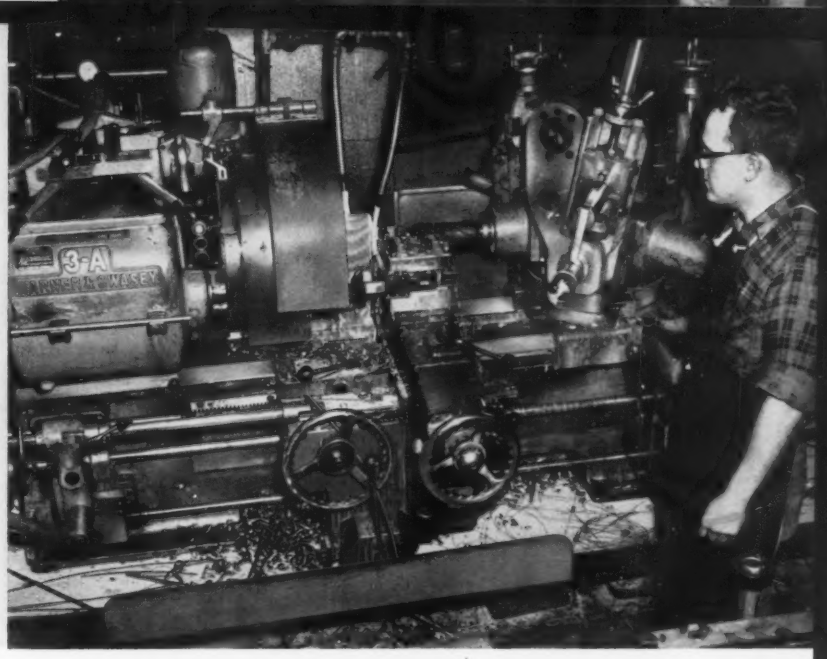


Fig. 6. (Left) Flame-hardening one track surface of the roller path casting to 500 Brinell. Two sprinkler heads located behind the gas nozzle cool heated area as casting rotates.

Fig. 7. (Right) Machining tapered bogie rollers from 6 1/4-inch diameter bars of resulphurized AISI 4150 steel. Eight of these rollers ride in the V-shaped track of the roller-path to support the upper structure.

four and five. Movement of the torches is made to conform to a pattern by an electronic tracer on the right-hand side of the machine.

The electronic tracer is basically the same as a manual tracer except that it substitutes its own electric eyes for the eyes of an operator for following the template. A scanning head and a control panel compose the unit. The scanning head, which is clamped to the operating bar of the machine, is a self-contained floating unit that is driven by a variable-speed motor. The optical system and the drive wheel are operated in unison by a steering motor.

Ink drawings with outlines approximately 1/8 inch wide can be used as templates. Other types of templates such as white tape on a black background or thin metal shapes with black-painted edges placed on a white background can also be used. Regardless of which type of template is used, it should be placed under a 1/8-inch thick clear plastic sheet for reasons of cleanliness.

Two parallel electric circuits are built into the scanning head. As a result, a balance is maintained in the control system, keeping the steering motor inoperative when a light spot from the optical system is located half and half on the light and dark areas of the template. As the outline of the template veers to one side the spot of light becomes unequally divided, and the control system is momentarily unbalanced. The steering motor then corrects to recenter the light spot, thus causing the scanning head to follow the template contour. Cutting speed can be varied up to 45 inches per minute in either direction. The operation illustrated in Fig. 8 is being carried out at the rate of 15 inches per minute.

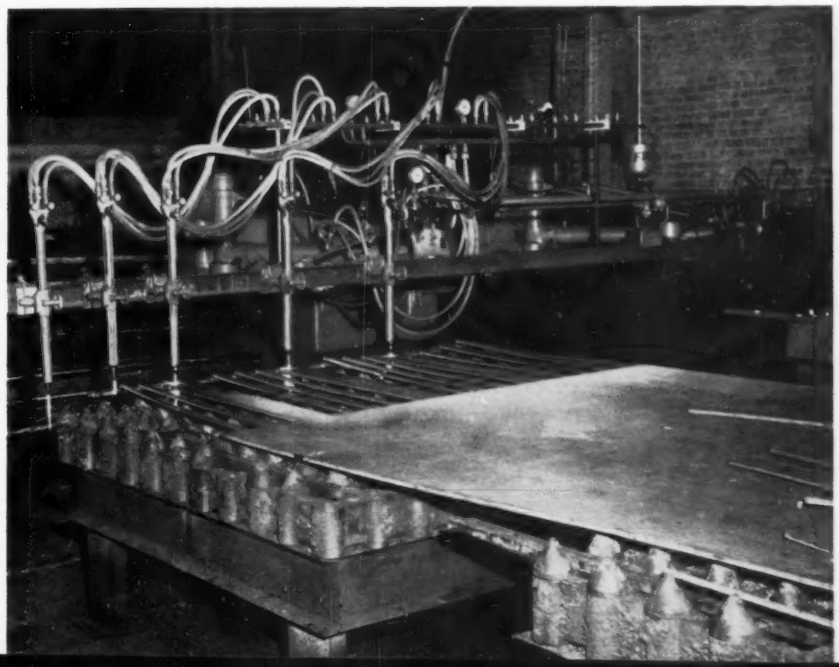


Fig. 8. Flame-cutting abrasion-resistant strips for bucket attachments from 1/2-inch thick steel plate. A light spot from the optical system of an electronic tracing head is employed to scan the template outline.

TRACTORS WITHOUT TRACKS

By PHILLIP HOEL, Plant Manager
and
PAUL BROADSTONE, Industrial Engineer
Construction Machinery Division
Clark Equipment Co.
Benton Harbor, Mich.

High-flotation tires are the tractive medium on the Michigan line of Tractor-Dozers and tractor shovels. Wheels for this equipment, as well as hydraulic cylinders for operating the dozer bowls or the shovel buckets, are manufactured at the company's new Pipestone Plant.

AT ITS recently constructed plant in Benton Harbor, Mich., the Construction Machinery Division of the Clark Equipment Co. is producing a complete line of Michigan tractor shovels, excavator-cranes, and a 165-H.P. Tractor-Dozer. The tractor shovels are being manufactured at an average rate of 264 per month. There are six models ranging in capacity from 16 cubic feet to 2 3/4 cubic yards—either gasoline or diesel powered. Excavator-cranes are being turned out in three models, either truck or crawler mounted, in capacities of 1/2 and 3/4 cubic yards.

The core of the tractor shovels, such as those shown in the heading illustration, is the power train which is engineered and built entirely in Clark's own plants. A heavy-duty torque converter supplies a steady flow of increasing power for digging into tough material. Oil for the unit is cooled by coils in the lower tank of the radiator and is circulated by a pump in the torque-converter housing.

From the torque converter, power is transferred to a Power-Shift transmission. This transmission has five shafts, all mounted on tapered roller bearings. Power to the output shaft is controlled by hydraulically operated clutches. Axles are of the heavy-duty planetary type designed for off-the-road service. Primary reduction is by bevel gear and pinion, with the planetary secondary reduction being located in the hubs of both the front and rear axles.

Fabrication of wheels for the large high-flotation tires (23.5-25 on the Tractor-Dozer) requires some interesting operations. Although the rims are purchased already formed, the wheel discs are produced and assembled in the plant. They are flame-cut five at a time from 1/2-inch thick plates of SAE 1020 hot-rolled steel. This is done on the Airco electronically controlled pantograph type flame-cutting machine shown in Fig. 1.

The electronic tracing head can be seen on the right-hand side of the operating bar. Directly beneath it is a full-size template of the wheel disc being cut. A black outline of the part is drawn on a white background—the template being placed beneath a clear plastic sheet to protect it from possible damage.

An exciter lamp within the tracing head sends a beam of light through a condenser lens, a light aperture, and an optical cell, which results in a small spot of light that is projected onto the tem-



plate. This light spot is "seen" by two photoelectric tubes in two parallel electric circuits. As long as the light spot falls equally on the light and dark areas of the template, the tracer head will travel a straight line, driven by a finely knurled tracing wheel that is operated by a feed motor.

When the template outline curves away from the light spot, the balance between the two parallel electric circuits is upset. This unbalance triggers a steering motor which promptly alters the course of the tracing head until the light spot is again divided equally between light and dark areas. Speed of the feed motor is variable, being set to drive the tracing head at a rate of 20 inches per minute in the illustrated operation. A template consisting of a white outline against a black background would have the same results as the template presently being used.

Bolt holes are drilled through this 22-inch diameter wheel disc on a Natco multiple-spindle drilling machine, Fig. 2. The disc is located in a fixture at four points around its periphery. Four clamping fingers swing in to grip the work when a handle on one of the fingers is moved to the right as shown.

The drill head then descends, drilling ten equally spaced 1 3/16-inch diameter holes through the disc. Turning at a speed of 186 R.P.M., the drills are fed through the 1/2-inch thick steel plate at a rate of 0.021 inch per revolution. On a similar machine, ten 1 3/4-inch diameter ball end-mills are used to form a spherically shaped countersink to a diameter of 1 7/16 inches to accommodate the ball-shaped heads of wheel mounting lugs.

Wheel discs are welded inside wheel rims on the unique company-designed machine shown in Fig. 3. A wheel rim is placed flange side up on the horizontal fixture seen in front of the work-spindle. A wheel disc is inserted into the rim, positioned over three pins extending up from the platen of the fixture, and clamped. With the rim and disc in proper relation to one another, four equally spaced 3/4-inch long tack welds are made by hand using a 3/16-inch diameter Class E 6011 mild-steel electrode.

After being unclamped, the wheel assembly is removed from the fixture and placed against a mounting plate on the end of the rotating spindle of the automatic welding machine. Once again the wheel is located by pins that pass into the lug holes in the wheel disc. A three-pronged locking spider engages the end of the spindle and bears against the wheel disc. The spider is drawn in by an air cylinder to lock the wheel in place.

Two Linde Unionmelt welding heads lay down a bead on both sides of the wheel disc simultaneously. One head can be seen in operation in Fig. 3, while the second head operating behind the wheel assembly is shown in Fig. 4. Both 70-inch long 3/16-inch fillet welds are made using 5/32-inch diameter wire with a welding load of 400 amperes at each head. The wheel assembly is unclamped and removed from the machine.

Operation of the boom and bucket on the tractor shovel is by means of four hydraulic cylinders. Two large double-acting boom cylinders

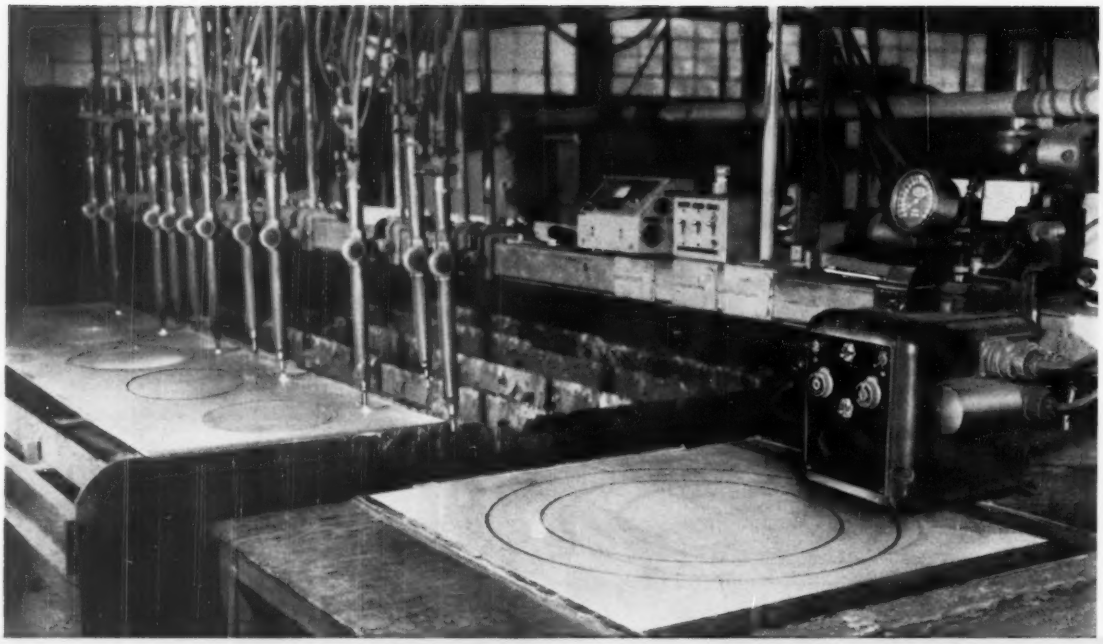


Fig. 1. Wheel discs are being flame-cut, five at a time, from 1/2-inch thick plate of mild steel. An electronic tracing head, foreground, follows the black outline on the template.

on the 2 3/4-cubic-yard capacity machine supply the power necessary to lift loads weighing up to 15,000 pounds. Two smaller double-acting cylinders provide the break-out digging action of the bucket.

Piston-rods are chromium-plated for extended life. Both the boom and the bucket cylinders are operated by a gear pump that is mounted behind the torque converter and is driven by a heavy-duty drive-shaft splined to the engine flywheel. All four cylinders make use of interchangeable chevron ring packings.

Boom cylinders for the 1 1/4-cubic-yard capacity tractor shovel start out at SAE 1015 cold-drawn steel tubing having an inside diameter of 4 1/2 inches and a wall thickness of 1/4 inch. The 38 1/2-inch lengths of tubing are placed upright in a welding fixture. Four mounting bosses are tacked equidistantly around one end of each tube. The tube is removed from the fixture, placed on a table, and the bosses welded in place. Two elbows for the hydraulic connections, one at each end, are first tacked over previously drilled holes and then welded.

When the boom cylinders have reached this stage of completion, they are brought to a Barnes-dril honing machine. Here the bore of the tube, as drawn, is honed to a finished diameter of 4.525 to 4.530 inches. The first phase of the cycle consists of ten strokes of the honing stones at a speed of 125 R.P.M. and a feed of 9 inches per revolution. After expanding the honing tool, another ten strokes are taken at the same speed. This procedure is followed one more time, bringing the inside diameter of the tube to size. The inner surface is brought to a finish of 8 micro-inches by using 240-grit emery at the same speed of 125 R.P.M. and feed of 9 inches per revolution, or approximately 94 lineal feet per minute.

Remaining machining of the cylinders is done on a Monarch engine lathe. A plug is inserted in the end of the tube having the mounting lugs to prevent distortion of the finished bore when the chuck jaws are closed. A steadyrest is used to support the overhang of the work. The opposite end of the part is faced with the lathe running at 264 R.P.M. at a feed rate of 0.010 inch per revolution. Both the inner and outer edges of the end face are chamfered at the same speed but with a hand feed.

The cylinder is reversed end for end and rechucked. A facing cut is taken on the opposite end to bring the part to an over-all length of 38.240 to 38.250 inches. When a 1/32-inch by 15-degree chamfer has been cut on the inner edge, the cylinder is removed from the lathe.

To close the cylinder a cast end cap is welded to the end opposite the mounting lugs. It is this cap that is connected to the tractor body. The cylinder is placed in a bench fixture and the end cap is positioned with regard to the hydraulic connector elbows. Four 1/2-inch long tack welds are made by hand with a 3/16-inch diameter Class E 6012 electrode at a load of 200 amperes.

A complete circular weld bead is laid down on the company-built machine shown in Fig. 5 which is equipped with an automatic Lincoln submerged-arc welding head. The open end of the cylinder is gripped in a three-jaw chuck while a pair of rollers provides support for the opposite end. Electrode wire, 5/32 inch in diameter, is fed into the blanket of granulated flux as the work-piece rotates at a speed of 1 R.P.M. The welding machine is set for a current flow of 300 amperes. Excess flux that falls from the weld area is collected in a pan placed on the machine bed. When the 16-inch long weld has been completed, the cylinder is removed from the machine, and the solidified flux chipped off.

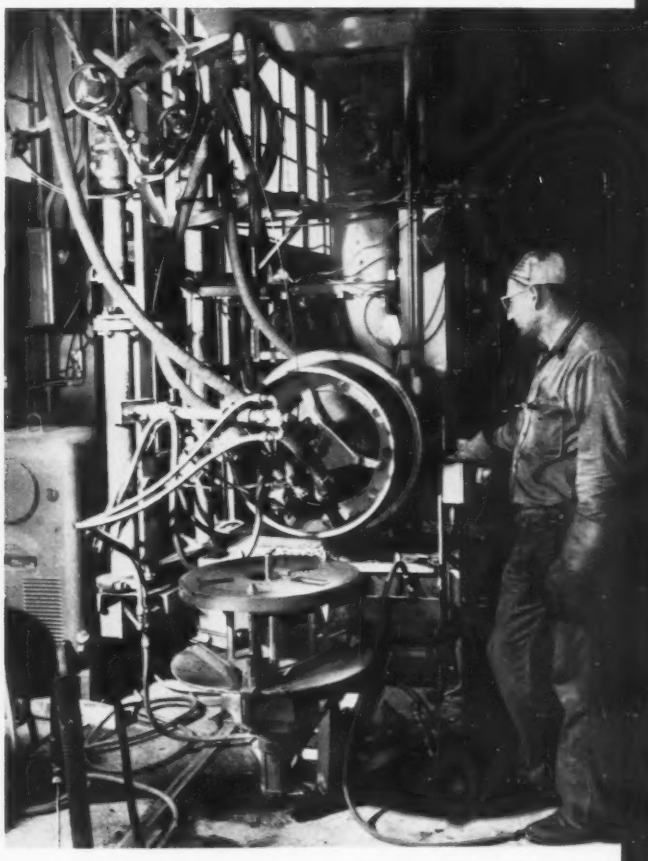
Crane, clamshell, and dragline operations can be handled easily by the Michigan excavator-crane. Available on either a truck or crawler chassis, the upper mechanism for any particular capacity machine is basically the same. The backbone of the upper mechanism is a cast-steel turntable on which most of the boom-operating mechanism is situated.

On the 3/4-cubic-yard, 25-ton capacity excavator-crane the steel turntable casting measures approximately 3 feet wide, 1 foot high, and 6 feet long. The casting, which weighs about 1950 pounds, is set up on the table of a Gray planer type, double-housing milling machine. Both sides of the turntable are milled simultaneously by the side-heads, Fig. 6. Two 12-inch diameter face-milling cutters having fourteen inserted carbide teeth rotate at 63 R.P.M. while the table feeds past at 10 inches per minute.

Fig. 2. A wheel disc is being clamped in a fixture on this drilling machine. Ten equally spaced mounting-lug holes are drilled.



Fig. 3. A wheel disc is tacked to a rim and positioned on this welder. A second bead is formed on the opposite side of the disc.



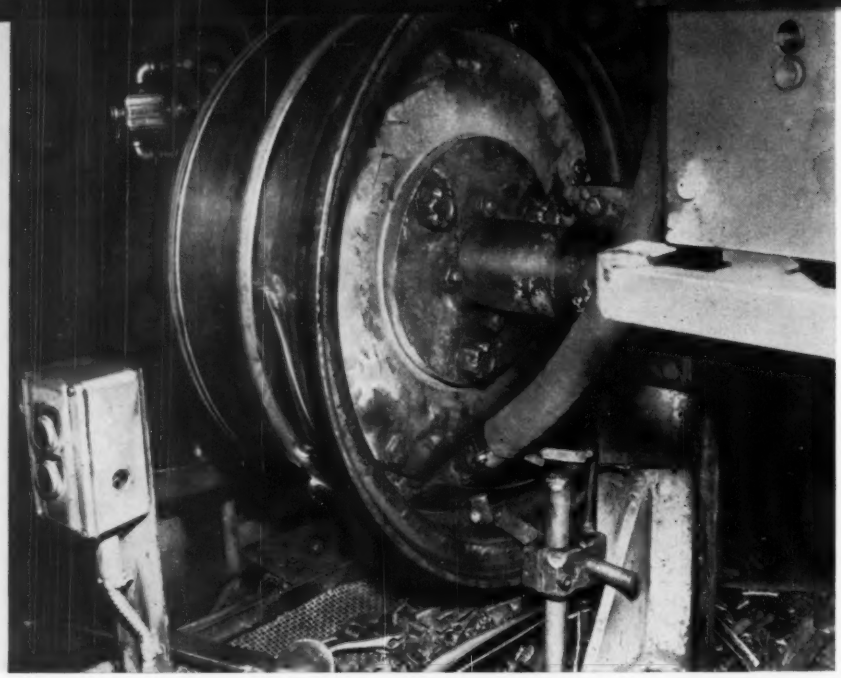


Fig. 4. Reverse side of wheel illustrated in Fig. 3. A second submerged-arc welding head is laying a bead around the joint of the flame-cut wheel disc and the rim.

One rough and one finishing cut is taken on each side. However, each cut consists of two passes with each pass covering only one-half the height of the side. After the last pass is completed, the cutter takes a back drag cut at the same speed but at double the feed rate—20 inches per minute.

The left-hand vertical milling head, driving a 10-inch diameter face-milling cutter with twelve inserted carbide teeth, is brought over the casting and fed down to finish the top surface of two side-rails and one cross-rail. Three cuts are taken along each rail at a speed of 103 R.P.M. and a feed of 10 inches per minute. Following this, the cutter is lowered into the casting to face six mounting pads.

A single-point tool is mounted on one vertical head to rough-bore a 7-inch diameter hole on the center line of the casting. The tool is rotated at a speed of 82 R.P.M. and is fed in at the rate of 1 inch per minute. Also rough-bored are a 6 3/4-inch diameter hole and 5-inch diameter hole. The first of these three holes is finished at a speed of 164 R.P.M. with a feed rate of 2 1/2 inches per minute to a diameter of 7.126 to 7.128 inches. At 102 R.P.M. and 1 1/4 inches per minute the 5.000- to 5.003-inch diameter hole is finished. With the boring tool running at the same speed and feed rates as were used for the first of the three holes, the 6.748- to 6.750-inch diameter hole is finished to size.

Drilling and facing of four boom-support lugs; drilling, boring, and reaming of six roller bosses; and drilling and tapping of numerous small holes

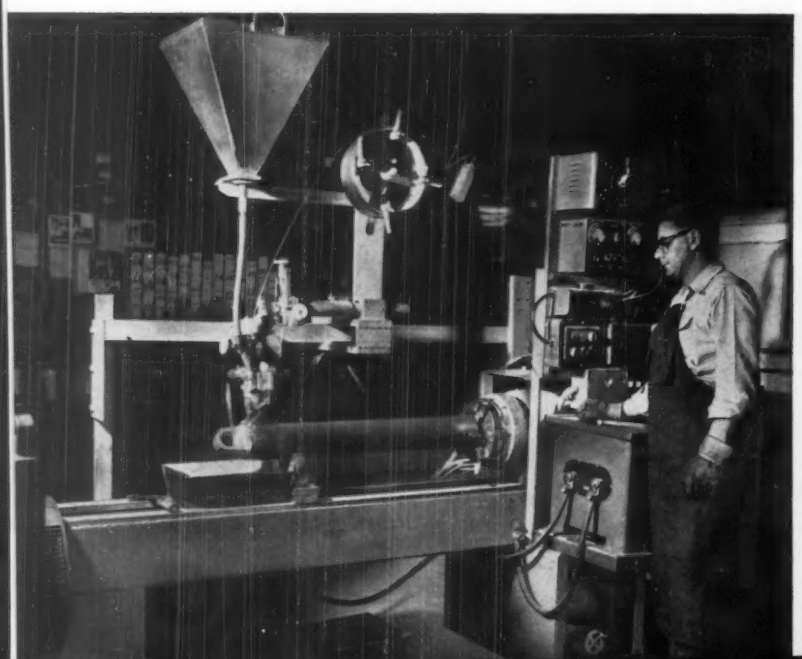


Fig. 5. A cast end-cap is being submerged-arc welded to one end of a machined hydraulic cylinder. The machine, which is company-built, rotates the partly completed cylinder at a speed of 1 R.P.M.

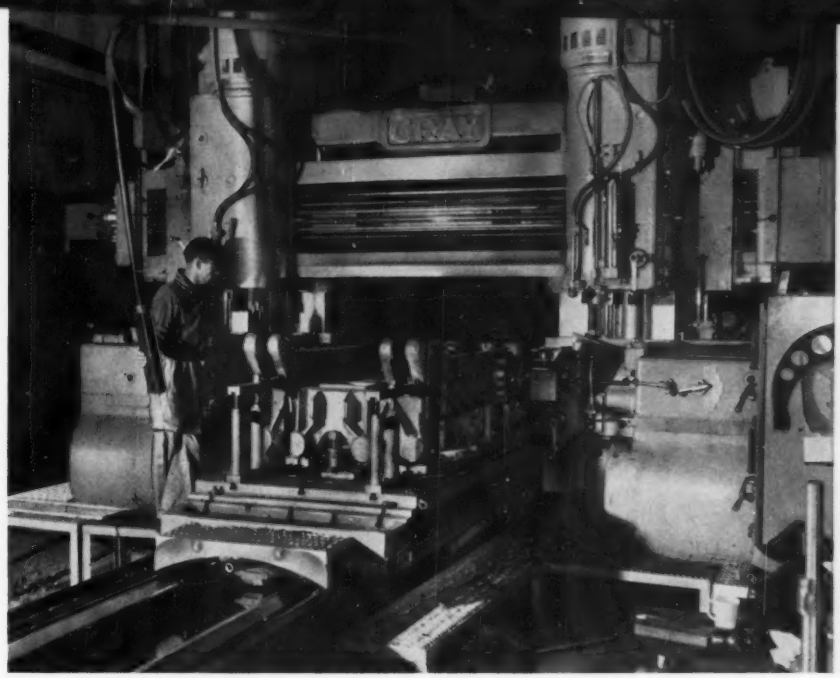


Fig. 6. Both sides of a turntable casting are milled at the same time on this planer type milling machine. The turntable forms the backbone of the 25-ton excavator-crane.

are still required. To handle the drilling, boring, reaming, and facing operations, the turntable casting is transferred to the table of a versatile machine that was engineered and built by the company. This machine combines the operating features of a horizontal boring mill, a vertical boring mill, and a planer mill.

In Fig. 7 can be seen the rough line-drilling of one pair of boom lugs with a 1 1/4-inch diameter drill rotating at 154 R.P.M. and feeding at 0.008 inch per revolution. This is followed by 1 3/4- and 2 17/64-inch diameter drills at the same feed rate but at only 64 R.P.M. The second pair of boom lugs is handled the same way. Using a pilot-bar and a 3/4-inch square single-point tool, the opposed faces of both pairs of lugs (four faces in all) are cut to a 3-inch gap dimension. With the same setup the remaining face of the two center lugs is cut.

To machine the roller bosses, four of which can be seen above the boom lugs in Fig. 7, it is necessary to reposition the casting. These bosses are finished in a similar manner to the four lugs. They are drilled with 1 1/4-, 1 3/4-, and 2 3/8-inch diameter drills, after which they are faced. The holes are opened up with a 2 5/8-inch diameter drill and then bored to 2.743 inches in diameter. As a final step, the bores are reamed to 2.750 to 2.752 inches in diameter at a speed of 64 R.P.M. and a feed rate of 0.016 inch per revolution. All remaining fitting holes that are required to be drilled and either reamed or tapped are taken care of on a Carlton 4-foot radial drilling machine.

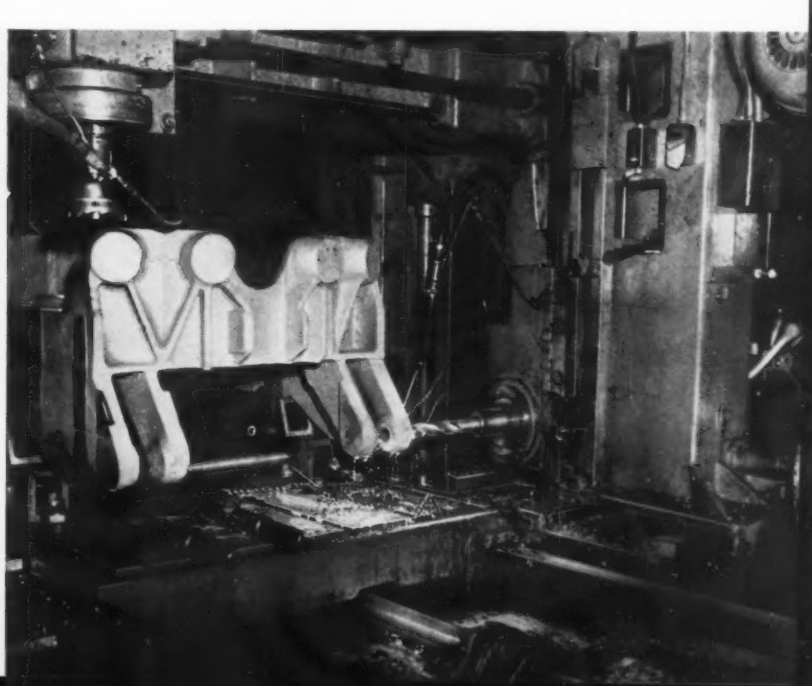


Fig. 7. Line-drilling a pair of boom mounting lugs on a turntable casting. This company-built machine combines the functions of a horizontal and vertical boring mill, and a planer mill.

A SMOOTHIE DOES ITS

THE "sculptor" of a new road is often a versatile piece of equipment known as a grader. This machine goes to work after excavators and bulldozers have cleared the right-of-way, and scrapers have juggled the surrounding terrain to raise or lower the level of the roadbed as required by the topography.

An Austin-Western grader is shown in the heading illustration. Consisting essentially of a big blade supported at an angle to its direction of travel, the machine leaves a smooth surface behind it and forms a windrow of the excess earth to one side. When the grader works in an adjacent lane, this windrow disappears, and a new one is formed.

The blade has unusual flexibility: end-to-end blade height can be varied to bank one side of the road or leave a crown in the middle; blade working angle can be adjusted through 360 degrees for such operations as finishing, trench-forming, or back-grading; and the blade can be side-shifted to reach a slope while the vehicle itself remains on level ground. Other features of the grader are its all-wheel steering and its all-wheel drive.

The all-wheel steering permits a short turning radius and puts the rear end of the machine where it will most effectively resist the side thrust of the load on the blade. It also permits a strip to be finish-graded without leaving tire marks. The all-wheel drive—delivered to the front wheels through a series of shafts and universal joints—gives the grader maximum traction.

In addition, available attachments quickly convert the grader to other uses, such as snow-plowing, scarifying an old pavement, rolling, and earth-plowing and loading. Austin-Western, which is the construction equipment division of Baldwin-Lima-Hamilton, also produces tandem and three-wheel rollers, self-propelled and truck-mounted hydraulic cranes, and road sweepers. Described here are some of the division's manufacturing operations that are of particular metal-working interest.

Since front and rear axles of the grader are used for both driving and steering, linkage with

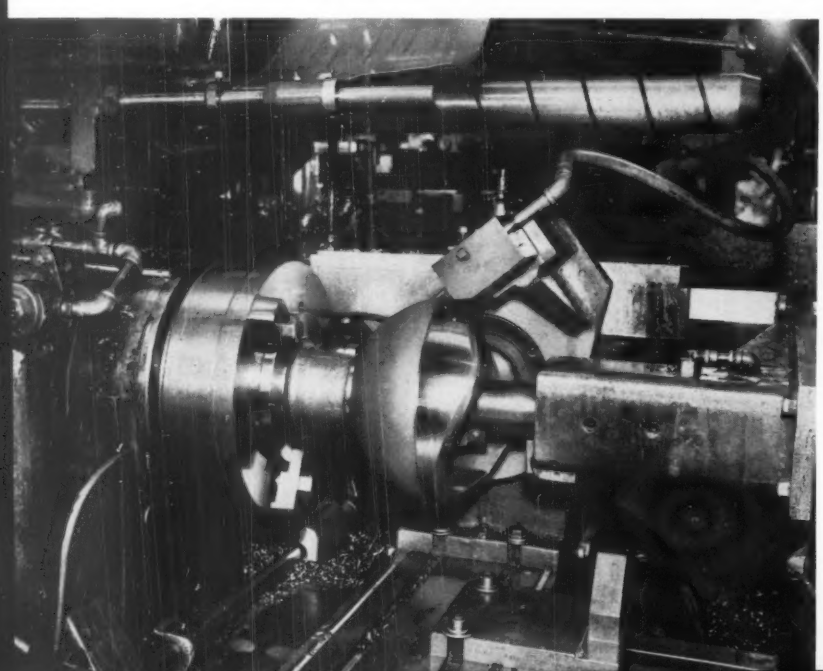


Fig. 1. In this unusual set-up the spherical socket body is turned as the radius attachment is fed forward by the turret of the machine.

LEVEL BEST

By M. R. VROMAN, Chief Inspector
Austin-Western Co.
Aurora, Ill.



the drive-shafts is through trunnion sockets. The socket is a steel casting, having a hollow spherical body and a flanged hub. Required machining, performed on a Potter & Johnston automatic turret lathe, consists of boring the hub; facing, back-facing, and turning the flange; and turning and boring the spherical body. The method of turning the body is the highlight of the various machining operations.

Radius Attachment Actuated from Turret Turns Spherical Body

A close-up view of the tooling and work-piece is shown in Fig. 1. In a previous setup, the flange and hub have been completed. The operations illustrated are the boring of a cored hole in the bottom of the sphere and the rough-turning of the body periphery. These cuts are combined. For the boring, a block type cutter is held in a bar, in turn, supported from an extension holder fastened to the face of one station of the machine turret.

On the rear of the cross-slide is mounted a radius-cutting attachment for turning the body periphery. The swivel-plate center of the attachment is on the horizontal center line of the machine spindle. A heavy spring keeps the cutter normally retracted toward the turret. Before starting the combined cuts, the cross-slide is moved forward until the path the cutter will take is on the vertical center line of the machine spindle. Also, the cross-slide carriage is locked against longitudinal movement.

As the turret advances for the feed stroke of the boring-bar, the extension holder is thrust against a pusher-bar assembly linked to the back of the swivel-plate. Continued movement of the turret forces the swivel-plate ahead, and the radius cutter, rising in an arc, removes the necessary material from the outside of the trunnion socket. When rough-boring and turning are completed, the turret is retracted, then advanced again, and finishing cuts are taken at the same settings.

One of the shafts used in the grader requires a spline at one end. The machine tool performing splining, shown in Fig. 2, is a Lees-Bradner six-

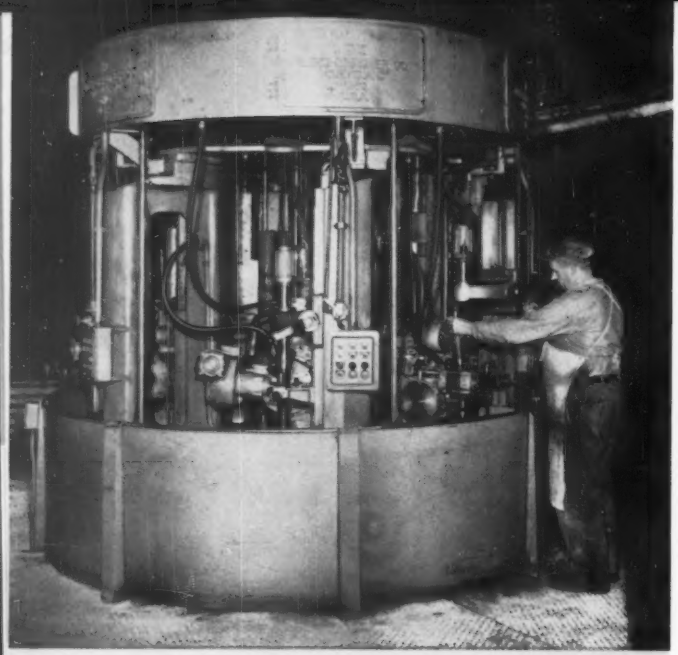
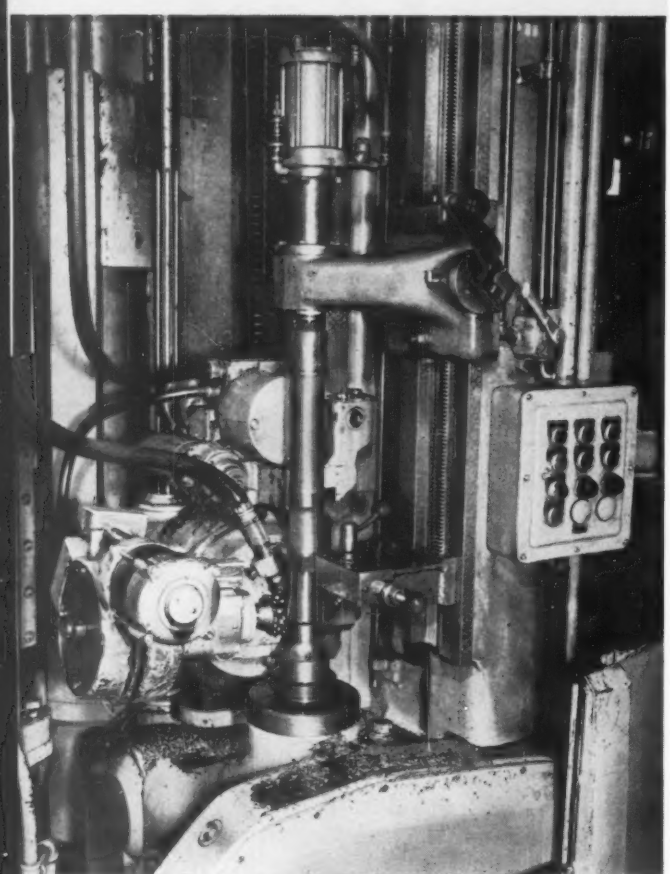


Fig. 2. Each spindle of the hobber works independently, yet all revolve like a merry-go-round.

Fig. 3. One of the six spindles of the hobbing machine. By the time this spindle cycles past the operator, the spline will be completed.



spindle rotary hobber. Six shafts are simultaneously in various stages of work, each spindle operating independently. At the same time, all spindles rotate slowly as a unit, like a merry-go-round, so that each spindle can be unloaded and reloaded by one man as it cycles past him.

A close-up view of one of the spindles appears in Fig. 3. The shaft is held vertically between centers. An air-operated tailstock thrusts the shaft against the headstock. Tooth-like claws around the headstock center embed themselves in the end of the work and serve as drivers.

The carrier on which the hob and its motor are mounted feeds vertically for the required length of the spline section. An automatic hob-indexing mechanism, which is a feature of the equipment, increases cutter life. The speed of the merry-go-round is set to permit the cutting at each spindle to be completed in one rotation—approximately fifteen minutes.

Magnetic Angle-Plate Holds Work on Milling Machine

To gain optimum use from many up-to-date machine tools, the company has adopted modern work-holding methods. In Fig. 4, for example, Neutrol magnetic equipment is employed on a Sundstrand Rigidmil. This three-spindle machine, tooled with 14-inch carbide cutters, face-mills the transfer and transmission gear-case of the grader. Five different sizes of gear-cases are handled.

The work, an iron casting, is seen being loaded into the fixture. Essentially, the fixture is an angle-plate, the vertical section of which is movable to accommodate the various sizes of cases. Both sections of the angle-plate have magnetic fields which are energized from the power unit seen in the foreground. Hold-down clamps are eliminated, and the work is secured rapidly and firmly, and without distortion.

Gear carriers for graders are precision-bored on a four-way Barnes drilling machine. Four holes must be rough- and finish-bored and grooved for snap-rings. Bores for different sizes of gear carriers are on varying center distances, necessitated by the different drive angles involved.

A close-up view of the work-fixture and tooling appears in Fig. 5. The fixture has an integral cross-slide secured over the bed of the machine. Each bore is machined in turn, with one pair of opposed boring-bars operating simultaneously. When one bore is completed, the upper part of the fixture traverses the cross-slide until the second bore is aligned with the other pair of boring-bars.

Fixtures are available for each gear-carrier size,

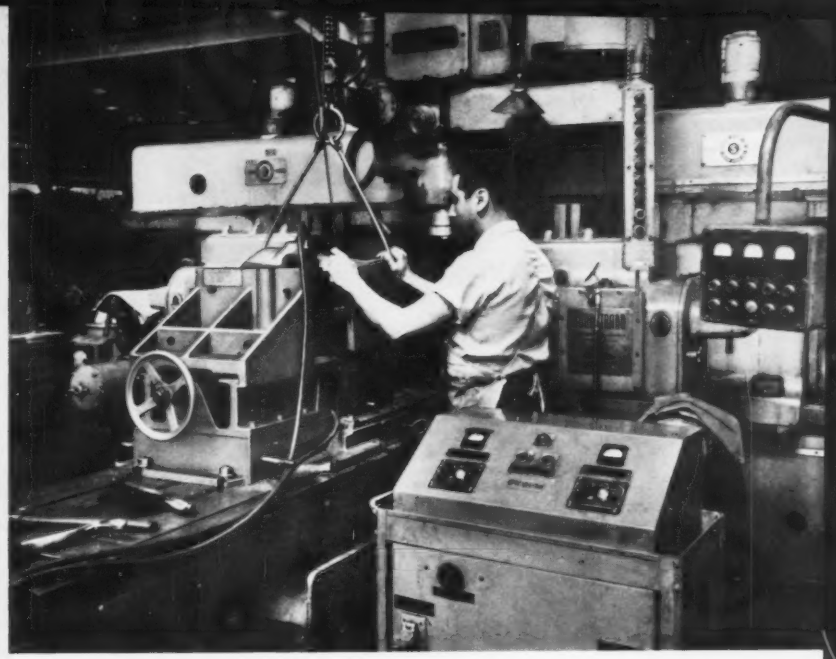


Fig. 4. The gear-case is loaded and unloaded rapidly, since the magnetic surfaces of the fixture make clamps unnecessary.

and all are designed to fit over the same cross-slide. Adjustable stops on the cross-slide limit the traverse of the fixture to the required center distance. Cycling is automatic, with all machine movements under push-button control.

Other precision boring of the gear carriers is performed on a Bullard vertical turret lathe, Fig. 6. Tooling held in turret bores three bearing and seal diameters, faces the top of a pinion bore, back-bores two diameters, and holds the spacing of five shoulder dimensions. All operations are completed from an initial setup on a heavy angle-plate.

The turret lathe is completely automatic, being equipped with a Man-Au-Trol. This attachment consists of two rotary detectors and a function drum which are electrically operated and controlled. Rotative speeds of the table and feed rates of each cutter are pre-selected. Once started, the turret advances, goes through an entire cycle, then returns to its starting point—completely automatically.

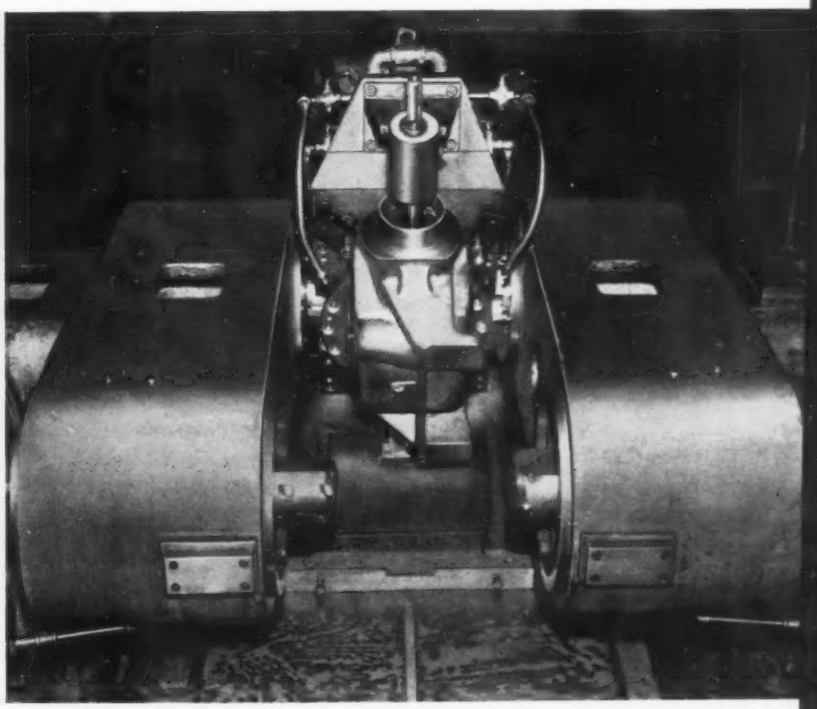


Fig. 5. When the rear bars complete one bore, the upper part of the fixture traverses its cross-slide to align the second bore with the front bars.

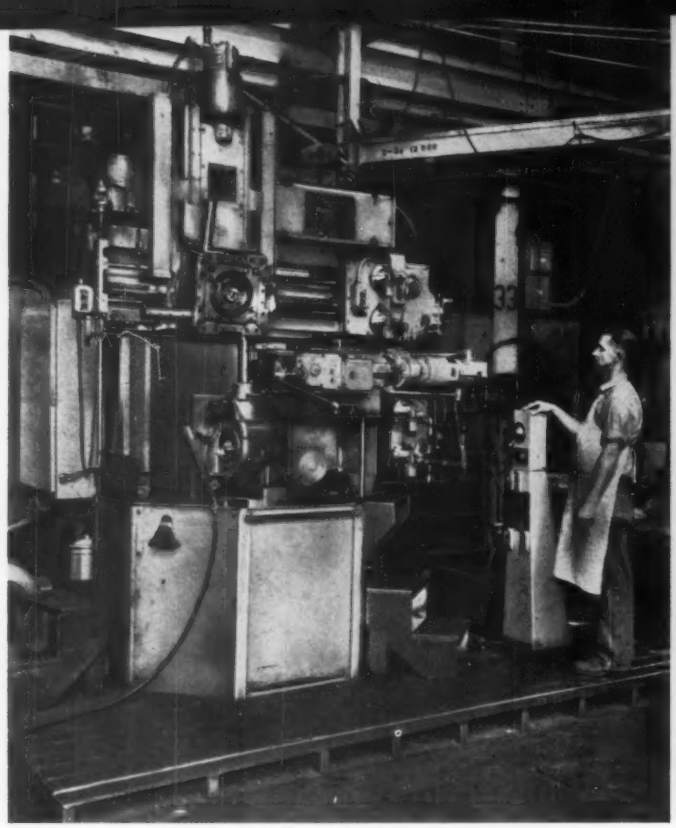


Fig. 6. (Left) The four stations of the square turret perform a series of precision boring and facing operations. Feeds and speeds are pre-set, and the cycle is completely automatic.

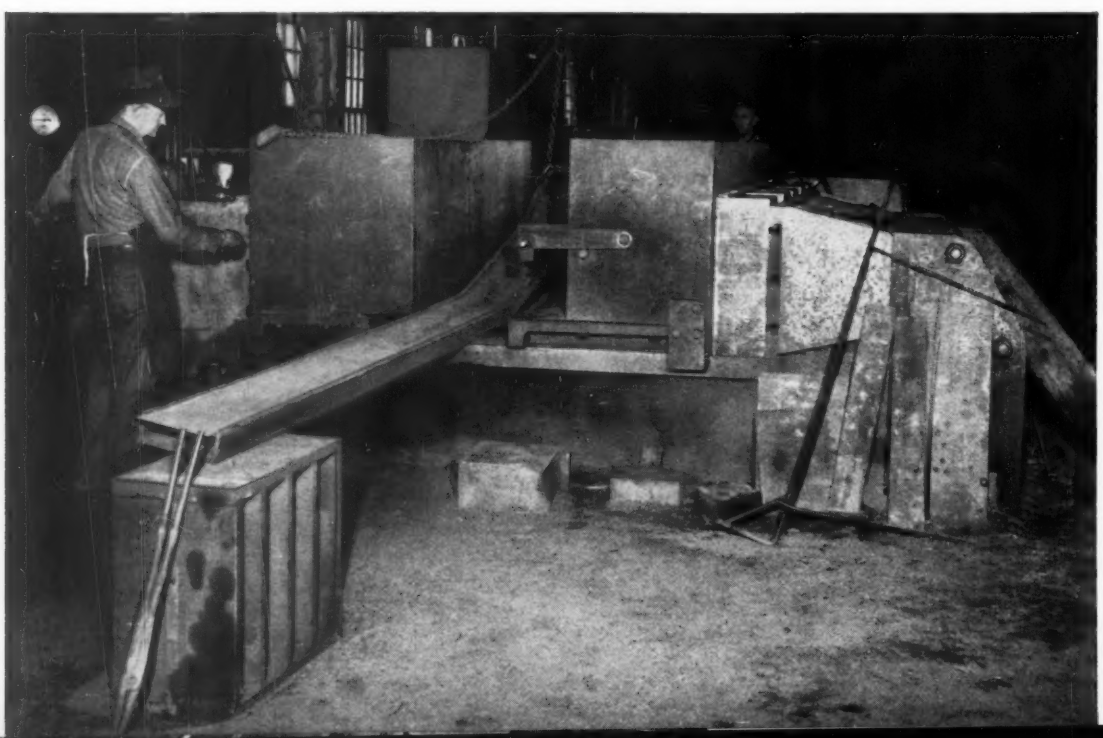
Fig. 7. (Below) This bulldozer makes the side rail bends in a red-hot structural section. Immediately afterwards, the work is placed in a setting fixture to control shape while cooling.

Grader frames are box structures formed by the welding of flat plate to U-channels. Incoming plates and channels are run through a dual-gun submerged-arc welder, and both seams are completed simultaneously. The structures are then bulldozed to required shape.

One of the operations is illustrated in Fig. 7. Here, a side rail approximately 24 feet long has just been formed and is in the process of being removed from a 500-ton bulldozer. Prior to forming, the work is brought up to heat for a stated interval in a gas furnace.

It is then located on edge across the bed of the machine between huge dies which close laterally to form the bends. Immediately upon removal, the work is placed in a setting fixture. Hydraulically actuated clamps secure the rail while it cools, so that the accuracy of the bent shape is preserved.

The general configuration of the grader begins





to take shape in the welding positioner seen in Fig. 8. Here, machined parts are tacked and welded to the main frame. The positioner is mounted on a trunnion at each end. By means of a push-button, it can be readily tilted to any desired welding angle. All locating points on the positioner consist of hardened and ground slides or pads. It was designed by Austin-Western and built by the Sterling Tool & Mfg. Co., of Milwaukee, Wis.

For the 360-degree adjustment feature of the grader blade, its moldboard is supported from a part termed a circle. Internal teeth of the circle mesh with the pinion of the adjusting mechanism.

The circle is developed from 6 1/4- by 6 1/4- by 1 1/4-inch angle. After being cut to length, it is formed to shape, and the ends are butt-welded. Teeth are flame-cut on a burning machine built by Austin-Western, Fig. 9. The illustrated circle is 62 inches in diameter and has sixty-five teeth.

The work is secured to a table by air clamps. The burning machine has a magnetic drive and is hinged to a bracket which is free to swing around a centrally located post. A template of the desired tooth form is mounted on the top of the post. In this way, template, burner, and work are in positive location to each other. The tooth profile obtained is sufficiently accurate without other finishing.

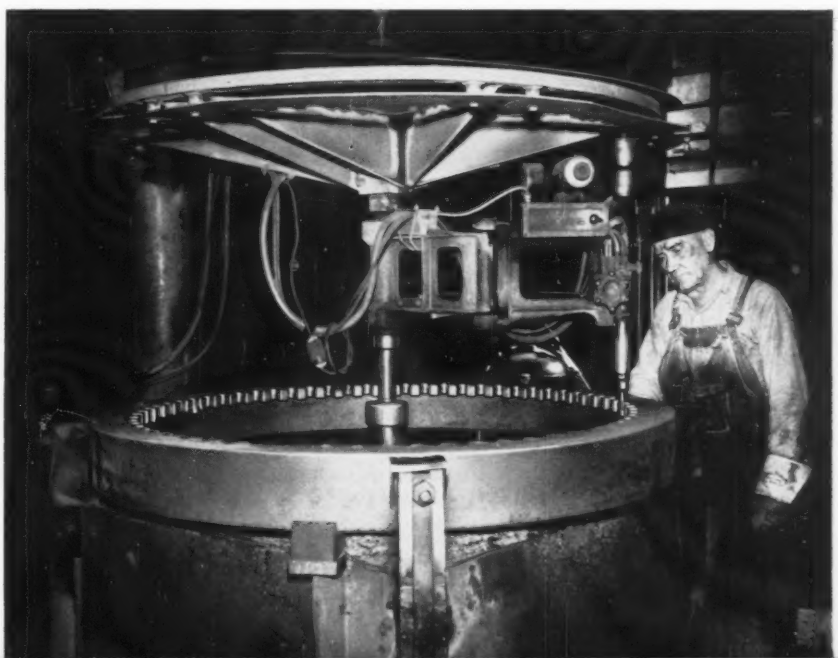


Fig. 8. (Above) Positioner is rotated on its trunnions, so that all welding can be performed at a convenient angle.

Fig. 9. (Right) The tooth profile, as burnt, is clean and accurate, and does not require subsequent machining.

"PAYHAULERS" ARE BUILT



A sturdy, heavy-duty frame and a welded reinforced steel body are combined in two new rear-dump trucks. Designed for off-highway hauling applications, these rugged trucks withstand severe punishment and give dependable performance over difficult terrain.

By RAYMOND H. SPIOTTA
Associate Editor

A NEW name has recently entered into the off-highway truck picture. International Harvester has introduced two rear-dump trucks—the Model 65 and Model 95 "Payhauler," having capacities of 18 tons (12 cubic yards, struck) and 24 tons (16 cubic yards, struck), respectively. The Payhaulers are being produced at the company's Melrose Park Plant, Melrose Park, Ill.

Being powered by 250-H.P. and 335-H.P. turbo-charged diesel engines, the two Payhaulers have a high ratio of horsepower per struck yard. Either a five- or ten-speed Fuller conventional transmission on the smaller truck gives it a speed of up to 36 m.p.h. The larger truck is supplied with either a Fuller nine-speed constant-mesh transmission and clutch or a four-speed Allison torque converter with Powershift transmission for a speed of up to 38 m.p.h.

The Payhauler shown in the heading illustration is the 24-ton capacity Model 95. It is being employed in building seven and one-half miles of two-lane highway alongside Route 67 between Bonne Terre and Halifax, Mo.

Both welded and conventional heavy-duty I-beams are employed for the truck frame, giving it a strong section modulus. The rear frame section is fabricated of rolled I-beams and is held rigid by tubular torque and hoist-mounting members. A channel type bumper torque member permits the front section to flex under shock loads.

Beams used to form the rear frame section are weldments. The top and bottom plates that cap the web are formed from 1-inch thick plates of SAE 1020 steel on an 800-ton capacity Steelweld press brake. They are then assembled with the web plate on a positioning fixture to form the I-shaped cross-section. A string weld is laid down

FOR RUGGED SERVICE

to hold the three members together in proper relation to one another.

The partially completed weldment is transferred to a Reeves positioner, Fig. 1. Here, the string welds are retraced with a Lincolnweld manual submerged-arc welding unit to lay down the final bead along each of the four joints. The welding gun is connected to a standard Lincoln SAE 600 welding generator.

A motor-driven mechanism automatically feeds 5/64-inch diameter copper-coated steel electrode wire through a hollow flexible cable to the welding gun. The feeding mechanism is regulated by a voltage control that maintains a constant voltage between the electrode and the work. Any variation in arc length is automatically compensated for, thus maintaining a constant electrode melt-off rate for any current setting.

An integral part of the welding gun is a cone-shaped dispenser having a capacity of about 2 3/4 pounds of flux which is dispensed by gravity through a replaceable copper tip. When the gun is held at the proper height for welding, a sufficient quantity of flux will flow through the tip and around the electrode to blanket the arc.

Although this is basically a hand welding operation, a power assist is employed. A Carlson Portamatic Pacer is used in conjunction with the welding gun. With this unit, a V-shaped drive wheel mounted behind the gun rests on the edge of the cap-plate being joined to the web. Rotative speed of the drive wheel, which controls the movement of the welding gun along the seam, is controlled by a separate portable unit. In the illustrated operation, the gun is following the seam at a speed of 12 inches per minute. All the operator need do is support the gun in an upright position and keep the flux dispenser filled.

Components that comprise the front and rear frame sections are located on a fixture and accurately aligned. While locked in proper relation to one another, the frame members are tack welded.

The solid frame is transferred to the trunnion type positioner shown in Fig. 2. Here, the previously tack-welded joints are gone over to complete the union between the frame sections. All other attachments that are to be a permanent part of the frame are welded in place at this time. Among these are included the transmission supports, fender brackets, steering-gear mounting bracket, and radiator grille support. The frames are then removed from the fixture, snagged, drilled, given a prime coat of paint, and delivered to the assembly area.

Payhauler bodies are of all-welded reinforced steel construction and have box sections to add strength to the heavy-gage side-plates. Bodies with either straight or sloping sides are available for both models of trucks. All models will be designed so that they can be converted to heated bodies by the installation of an engine exhaust conversion kit.

Members that require forming are handled on an 800-ton capacity Steelweld press brake. Flat, shaped components are cut on electronically controlled Airco flame-cutting machines. Sides and outer front plates of the straight-sided body are of 3/8-inch thick hot-rolled SAE 1020 steel. The wear plate (floor) and inner front plate are of Man-Ten steel.

Bottoms for the dump bodies are of a sandwich type construction. The lower plate, on the outer surface of the body, is 3/8-inch thick hot-rolled SAE 1020 steel. Above this plate are 2- by 6-inch filler beams of oak to absorb the shock when heavy loads are dropped into the body. The third layer of the sandwich is a 1/2-inch thick wear plate of Man-Ten steel that will stand up under abusive working conditions. Bottom construction on heated bodies is modified by replacing much of the wood filler with 3-inch deep (7.1 pounds per foot) ship and car channels for heat passage.

Each section of the body is first jig-welded as an individual sub-assembly, and then these are welded together to form the final body shape. At this point, the body is supported on a trunnion type Worthington positioner, Fig. 3. All other units that are to be a part of the completed body, such as hoist fittings, reinforcing members, and the canopy that extends over and protects the cab, are now assembled.

The upper edges of the body are reinforced with lengths of angle-iron welded to them, using 3/16-inch diameter Class E 7016 Atom-Arc electrodes. In the illustration can be seen the welding of a pivot casting to the bottom of weldment.

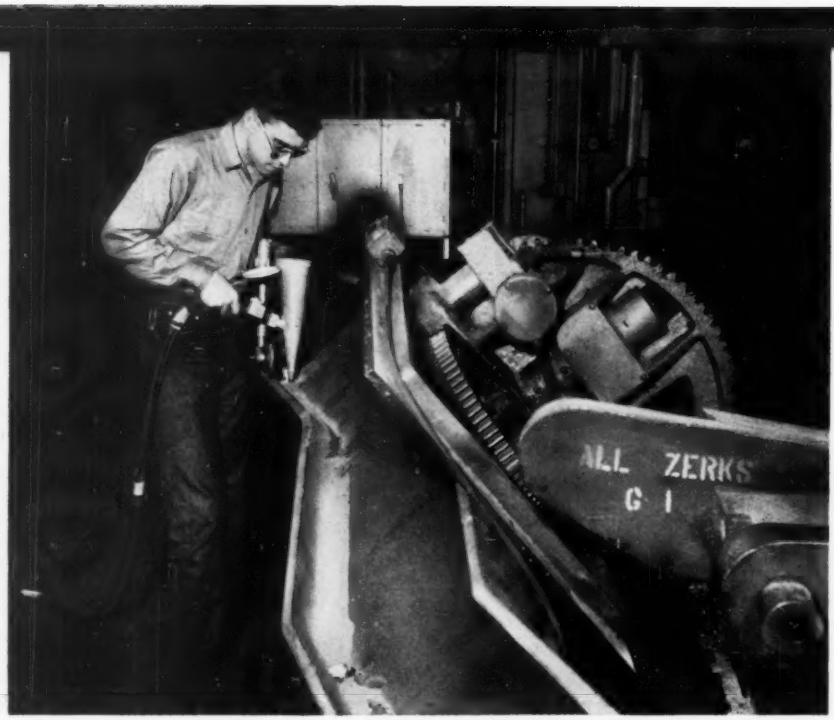


Fig. 1. (Right) Submerged-arc welding upper and lower caps to a web section to form a shaped steel I-beam. This weldment is one of two that form the rear frame section of the Payhauler.

Fig. 2. (Below) Joints between front and rear frame sections are being welded on this trunnion type positioner. While supported in this way, other members such as fender brackets are welded in place.

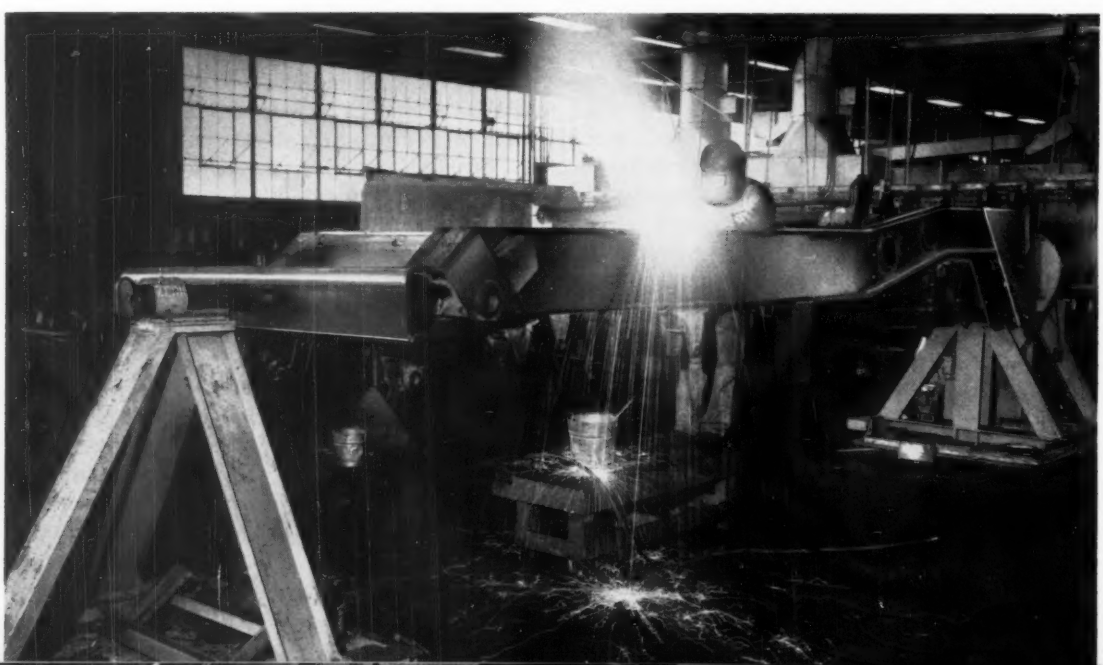
The double-acting hoist cylinder is attached to this casting to raise and lower the body for dumping.

Drive-axle housings for the Payhaulers are of cast-alloy steel construction and have two integral mounting pads that support semi-elliptic, multiple-leaf, free-floating rear springs. The castings are received from the foundry with the spring pad faces already machined and with one 0.998- to 1.000-inch diameter hole reamed 0.88- to 1.00-inch deep in each pad. Using these two pads and two holes for locating, the casting is mounted on the table of a 52-inch King vertical turret lathe, Fig. 4.

A boring-bar mounting two single-point tools is fed down into the housing. The first tool rough-cuts the 19-inch inside diameter of the differential mounting face, then the second tool takes a semifinishing cut across the same surface. While still down-feeding, the first tool also rough-cuts an 18 15/16-inch inside diameter at the center of the casting.

The boring-bar is replaced with another having two finishing tools. In this step, the upper diameter is finished to 19.000 to 19.004 inches, and the lower diameter is finished to 18.937 to 18.941 inches. Additional operations performed in this setup include cutting a 1/16-inch by 45-degree chamfer in both bores and rough- and finish-facing the differential mounting face.

From the vertical turret lathe, the drive-axle housing is transferred to the Giddings & Lewis horizontal boring mill shown in Fig. 5. The work is placed in the large fixture illustrated and is



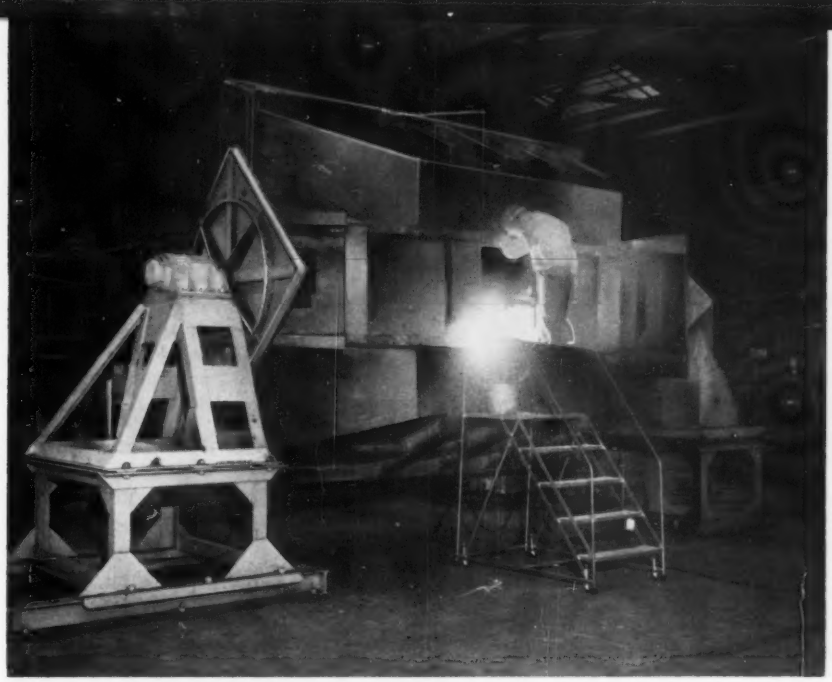


Fig. 3. Welding a pivot casting for a hoist cylinder to the bottom of a dump body. The bottoms are of sandwich construction—a mild-steel plate, oak beams to absorb shock, and, finally, a wear plate of Man-Ten steel.

again located from the spring pads and two reamed holes. This fixture was constructed by G & L and incorporates a pneumatically operated turntable for indexing the casting.

Davis block type tools are mounted along the length of a boring-bar. On the infeed of one combination cut, a 6.3735- to 6.3750-inch diameter bore is rough-, semifinish-, and finish-bored, and a 3.19-inch diameter clearance hole is finish-bored. When the tools have cleared these bores on the outfeed, a cam-operated chamfering tool is extended to take a 0.31-inch by 60-degree cut on the inner edge of the larger bore.

Using another boring-bar setup, a 4.0015- to 4.0045-inch diameter recess near the center of the casting (in line with the previously machined surfaces) is back-bored. After the spindle has been retracted, the machine table is moved out of line with the casting bores, and a 2.498- to 2.499-inch diameter hole is bored through an inner boss located below the spring pad. While the tool is being fed out, a facing cut is taken on the back side of the boss. The machine table is shifted in the opposite direction, and a 1.8725- to 1.8765-inch diameter radius-rod arm hole is finish-bored. When this has been completed, the turntable is indexed pneumatically 180 degrees, and the same operations are performed on the opposite (symmetrical) side of the casting.

Both hub flanges of the drive-axle housing are turned simultaneously on the 30-inch heavy-duty LeBlond lathe illustrated in Fig. 6. This is made possible by cutting from two carriages and cross-slides at the same time.



Fig. 4. A drive-axle housing for a 24-ton capacity Pay-hauler is shown being bored on a vertical turret lathe. During this operation, two internal diameters are bored and chamfered, and the differential mounting face is finish-machined.

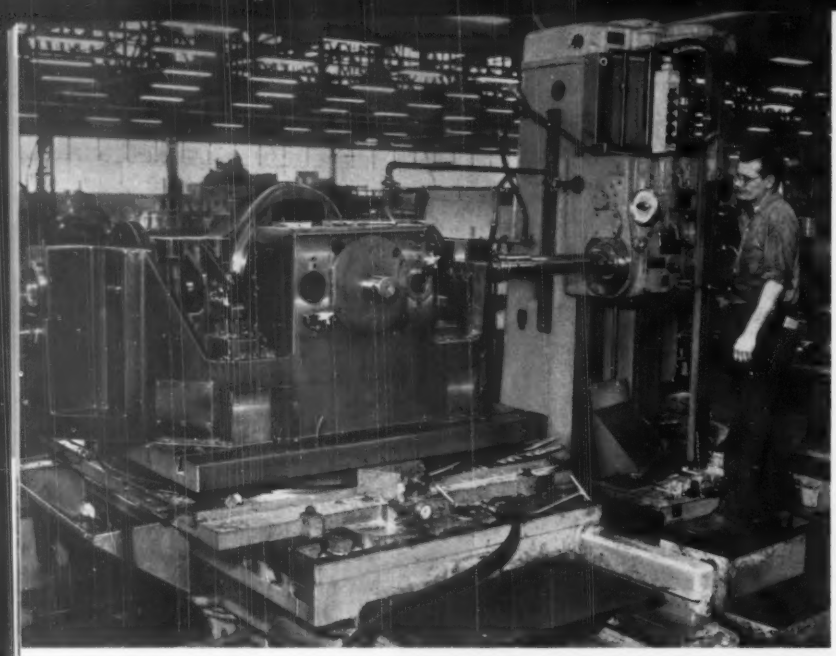


Fig. 5. Boring, back-boring, and chamfering in-line holes through one side of a drive-axle housing. To repeat the operation on the opposite side, the turntable-mounted fixture is pneumatically indexed 180 degrees.

Before being placed on the lathe, the casting is lowered by overhead hoist into an arbor loading fixture. A support arbor is then inserted in each end of the housing and locked in place. The hoist removes the work-piece from the loading fixture and positions it between centers on the lathe—the tailstock center being live.

Each of the two cross-slides supports two parallel, rectangular tool-holders. Each of these tool-holders is, in turn, double-ended and mounts two single-point, carbide-tipped tools. Both tool pairs are spaced to straddle the hub flanges.

On the first cut, the two cross-slides are fed in at a feed rate of 0.011 inch per revolution while the casting is being turned at a speed of 52 R.P.M. During this pass, both hub flanges are rough straddle-faced at the same time. When the slides have been backed off, the tool turrets are indexed 180 degrees to bring the opposite two pairs of cutting tools into position for the next cut. During the second infeed of the cross-slides both hub flanges are finish straddle-faced at the same rates of feed and speed that were used for the rough-facing cut.



Fig. 6. Both sides of two hub flanges are straddle-faced at the same time on this two-carriage lathe. Two pairs of tools on each tool post permit rough and finish straddle-facing in a minimum of time.

Diesel Power for Road-Building

(*Continued from page 139*)

in order to give the required wear resistance to the gear teeth.

Originally, the rough forgings were heat-treated and then completely machined. The free-cutting properties of the steel facilitated machining, and highly accurate gears were produced. However, wide variations in hardening characteristics were encountered because of the allowable range in the chemical analysis of the steel and differences in the cross-section of the gears. If the chemistry and hardenability were on the low side of the allowable specifications, it was necessary to drastically water quench the gears to achieve the necessary hardness in heavy sections. Conversely, if on the high side, an oil quench was required to prevent the thin sections of the gears from cracking. Between the high and low limits, it was necessary to devise many combinations of oil, air, water, and interrupted quenches. For example, in one instance, the gears were quenched for five seconds in water and then transferred to oil.

With such conditions, it was necessary to specify a different hardening procedure for each particular heat of steel. This required the use of two rotary furnaces and a battery of quench tanks having various degrees of agitation. Even so, considerable scrap resulted, and production was slow. One solution considered was the change to an alloy grade steel (SAE 4140-H) having a guaranteed hardenability of the heavy sections in an oil quench, thus avoiding the danger of cracking. This, however, would have increased the raw material costs considerably and made the machining operations more difficult. Also considered was water quenching of the rims only, by means of special fixtures, but it was determined that such a quench would not produce the required hardness all the time. Induction hardening of the finished gears was tried, and, although excellent hardness patterns and wear resistance were obtained, distortion of the helical teeth could not be controlled.

This difficult production problem was resolved by rough-machining the gear blanks to fit induction-hardening fixtures, then induction hardening and tempering the rims only, and finishing the gears by hobbing and shaving. Cracking in the light sections of the gears is eliminated because they are never heated, and unheated portions of the gears assist the water quench by removing heat. Also, most important, this method has permitted retaining the lower cost, free-machining carbon steel as the gear material. Other advan-



Fig. 8. Three-station induction-heating unit for hardening gear blanks forged from free-machining steel. A frequency of 3000 cycles is used for deep penetration.

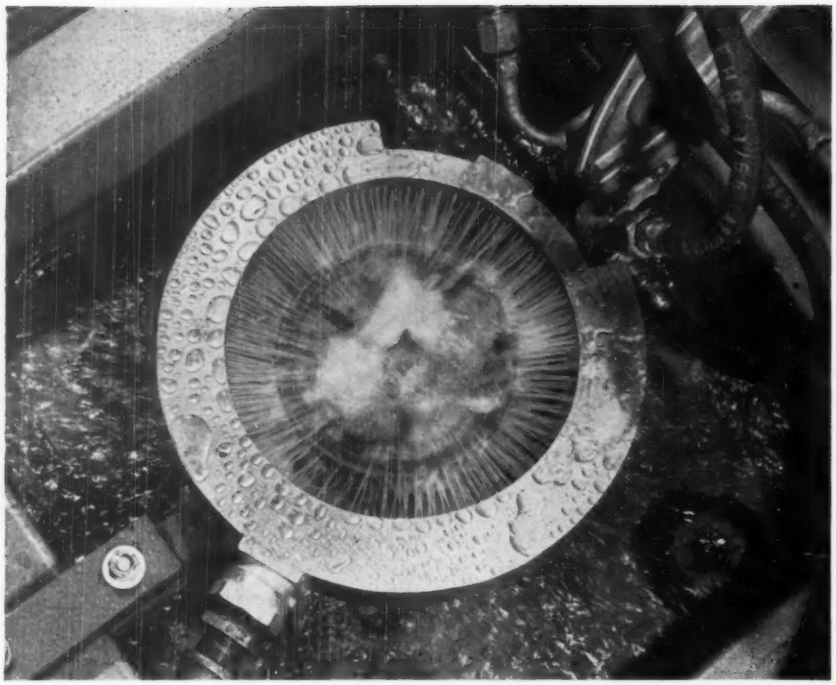


Fig. 9. After heating the gear blank to a temperature of 1600 degrees F., in about twenty seconds, the part is automatically raised and quenched by a water spray.

tages include the need for only one-third the floor space previously required, a three- to four-fold production rate increase, and elimination of a shot-blasting operation. Production can now be started immediately, whereas with the former method, it was necessary to heat the furnaces for about five hours before starting production.

The helical timing gear blanks, which vary from 4 to 10 inches in diameter and from 1 to 1 1/4 inches in width (with a thinnest cross-section of 1/4 inch), are forged at temperatures between 2200 and 2300 degrees F. Since the cooling is not controlled, the hardness of the forgings is nonuniform. For this reason, the blanks are normalized to a Brinell hardness of 163 to 187 for maximum machinability. Then, the forgings are rough-machined on Bullard Mult-Au-Matics. The heating coil conforms closely to the outside diameter of the gear blank, and the arbor of the induction-hardening fixture accurately fits the rough-bored hole.

Hardening is performed on a Westinghouse three-station induction-heating unit, Fig. 8. Current is supplied from a 200-K.W., 3000-cycle motor-generator set. This relatively low frequency was selected to provide deeper heat penetration (average depth of hardening is 3/8 inch) without the danger of overheating the surface. Rims of the gear blanks are hardened at the right and left stations, and the center station is for the thrust faces at the hubs of certain gears requiring hardness in this area. While all three stations are supplied with current from the one motor-generator set, they are interlocked so that only two stations can be heating at one time. In this way, one operator can easily attend all three stations.

In operation, the gear blanks are manually loaded on the fixture arbors and the cycle button is depressed. Each blank is automatically lowered into the heating coil and brought to a temperature of about 1600 degrees F. in approximately twenty seconds. In most instances (when the blanks are of uniform shape), the parts are rotated during heating. However, nonuniform-shaped parts are kept stationary, and the coils are designed so that the heavier sections receive more heat.

After the automatically controlled, pre-set heating time, the fixture is raised and the gear blank quenched by a water spray, Fig. 9. A typical heating and quenching cycle takes fifty seconds. The blanks are manually unloaded and allowed to cool in air to room temperature. Surface hardness is 50 Rockwell C or more, with a minimum hardness of 45 Rockwell C at a depth of 3/8 inch (which will be the location of the gear teeth roots). Then, the blanks are tempered to the required hardness of 26 to 32 Rockwell C in Lindberg Cyclone furnaces.

Production of cam-follower rollers has been speeded by the installation of a Wilson Set-O-Matic, fully automatic Rockwell hardness tester, Fig. 10. This machine is equipped with a Syntron vibratory hopper for automatic loading and sorts the work-pieces into three classifications—too

hard, too soft, or satisfactory—at the rate of 1000 parts per hour. The cam-follower rollers being tested are 7/8 inch in diameter by 17/32 inch wide and have a bore 9/16 inch in diameter. These parts are made from SAE 52100 steel and are required to have a hardness of from 60 to 63 Rockwell C after they have been heat-treated and then hardened.

Pan loads of the cam-follower rolls are dumped into the vibratory hopper, from which they slide down a chute seen at the upper left in Fig. 11. An electrically actuated rod pushes the rolls, one at a time, into testing position and, simultaneously, pushes a tested part into the unloading chute at the right. The Rockwell tester operates on the same basic principle as the hand-operated machine. With the part to be tested resting on an anvil, the minor load is applied automatically, the major load is applied and removed, and the difference in indentations measured.

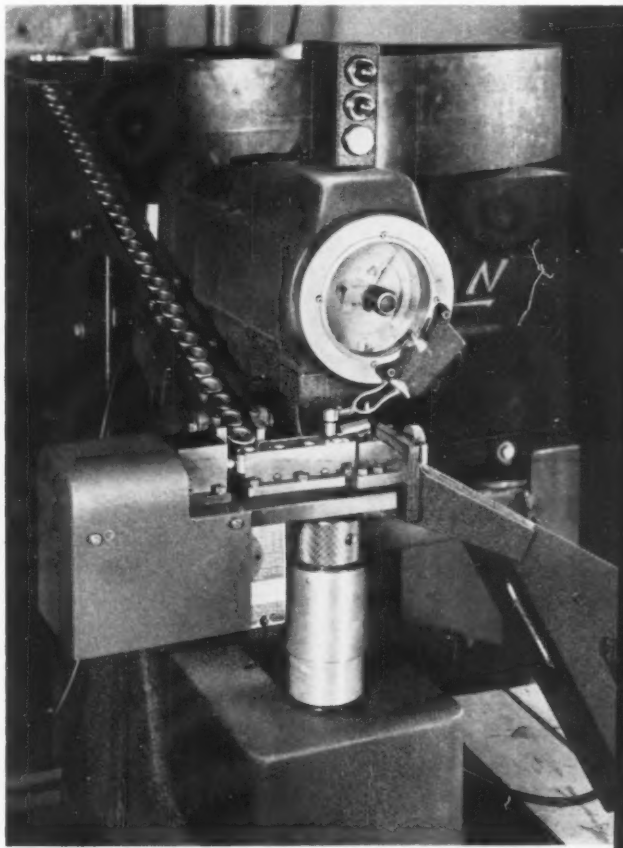
On the automatic tester, however, a source of light mounted on the outside of the dial indicator case is directed toward a prism located on the pivot arm of the indicator needle. This prism transmits the beam of light toward the periphery of the indicator dial. Here, three photo-electric cells are precisely located so that they will be affected individually by the reflected light if the part being tested is too soft, acceptable, or too hard. The cells, in turn, actuate gates in the discharge chute so that each part will fall into the proper bin.

Indicator lights are also provided on top of the tester to visually show the results. Parts having variations in thickness up to 3/8 inch can be accommodated without major modifications. However, the production rate will decrease slightly on thinner parts, due to the longer penetrator stroke required. The machine is equipped with two counters, one for daily or hourly output and the other for the accumulated total production. When not required for high-production parts, the tester can be used for semi-automatic or hand operation.

Fig. 10. Fully automatic Rockwell hardness tester in which work-pieces supplied by a vibratory hopper are inspected and classified at the rate of 1000 per hour.



Fig. 11. A beam of light is transmitted by prism on indicator pivot arm to photo-electric cells for sorting parts into soft, acceptable, or hard classifications.



Talented Tooling at Caterpillar

(*Continued from page 171*)

chamfers the drum periphery. Two more carbide tools carried on auxiliary cross-slides rough-face the part. During these cuts, the work speed is increased to 57 R.P.M., and the tools are fed at the rate of 0.010 inch per revolution.

Finish-boring, finish-facing, and another chamfering operation are performed with three carbide tools on the third-position turret face. Here, the work rotates at 103 R.P.M., and tools feed at 0.011 inch per revolution. A special twelve-spindle drill head and bushing plate, equipped with twelve collet chucks, are provided on the fourth face of the turret, Fig. 8. The chucks carry 17/32- by 41/64-inch diameter, two-flute, subland drills. Drills are driven through a 1 to 6 ratio gear train, powered by a pilot that enters the machine spindle. While the spindle rotates at 40 R.P.M., the drills revolve at 240 R.P.M. and are fed at the rate of 0.006 inch per revolution.

Before indexing the fifth-position turret face into cutting location, the steering clutch drum is inverted in the chuck. A total of ten tungsten-carbide tools are provided on this turret face and two auxiliary cross-slides—three for boring, three for rough-turning, three for chamfering, and one for slab-facing. These tools are fed at the rate of 0.016 inch per revolution, while the work rotates at 49 R.P.M. The casting is finish-bored, finish-turned, and finish-faced with three carbide tools mounted on the fifth and final face of the turret. Here the work speed is 88 R.P.M. and the feed rate 0.015 inch per revolution. Since the machining cycle is completely automatic, one operator can easily attend two lathes.

Spline teeth are cut in the bores of steering clutch drums on the Colonial 15-ton, two-column, vertical broaching machine seen in Fig. 9. The cast-iron drum is located and clamped in a pot type indexing fixture. To cut the 1/4-inch deep spline teeth, which have a pitch diameter of 14.875 inches, the high-speed steel broach bar is fed downward at 360 inches per minute.

Grinding and handling time has been reduced approximately 75 per cent by finishing both flange faces of track-roller shafts simultaneously with the setup shown in Fig. 10. This operation is performed on a Van Norman dual-head, bow-gage grinding machine, with the work mounted between centers and driven from a previously broached flat.

From 0.0035 to 0.005 inch of stock is removed from each flange face, with both grinding wheels (24 inches in diameter by 1 1/4 inches wide) hydraulically fed toward and away from the work at an angle. Vitrified-bond, aluminum oxide abrasive wheels of 54 grain size are used. The wheels are automatically dressed after grinding a preset number of parts by hydraulically controlled diamond tools, and the amount of abrasive removed is automatically compensated for.

Production of final drive cluster gears has been increased as much as 1500 per cent over previous methods of manufacture by cutting all the teeth of each gear simultaneously on Shear-Speed gear shapers made by the Michigan Tool Co. On one cluster of two gears, the thirteen-tooth pinion (having a diametral pitch of 1.96, a face width of 5 1/2 inches, and an outside diameter of 8 1/8

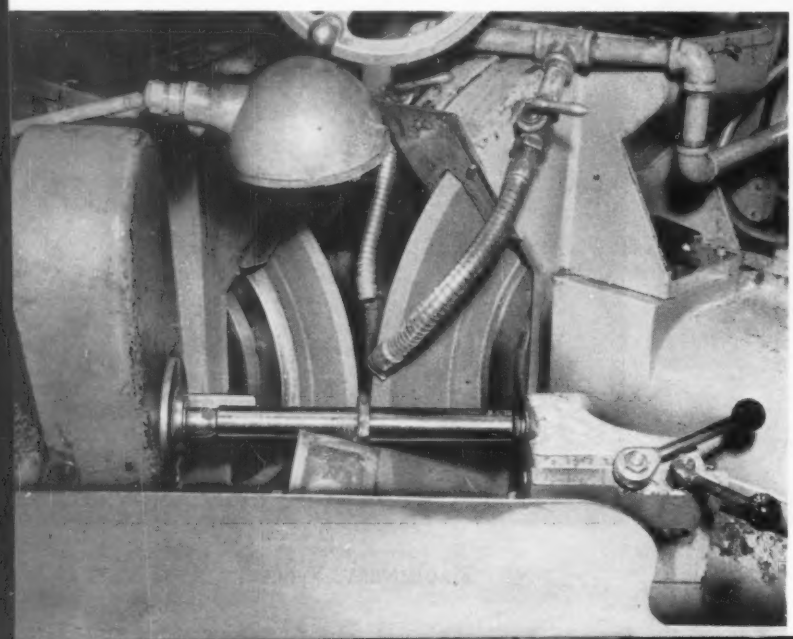


Fig. 10. Dual-head, bow-gage machine has reduced grinding and handling time approximately 75 per cent in finishing both flange faces of track-roller shafts at the same time.

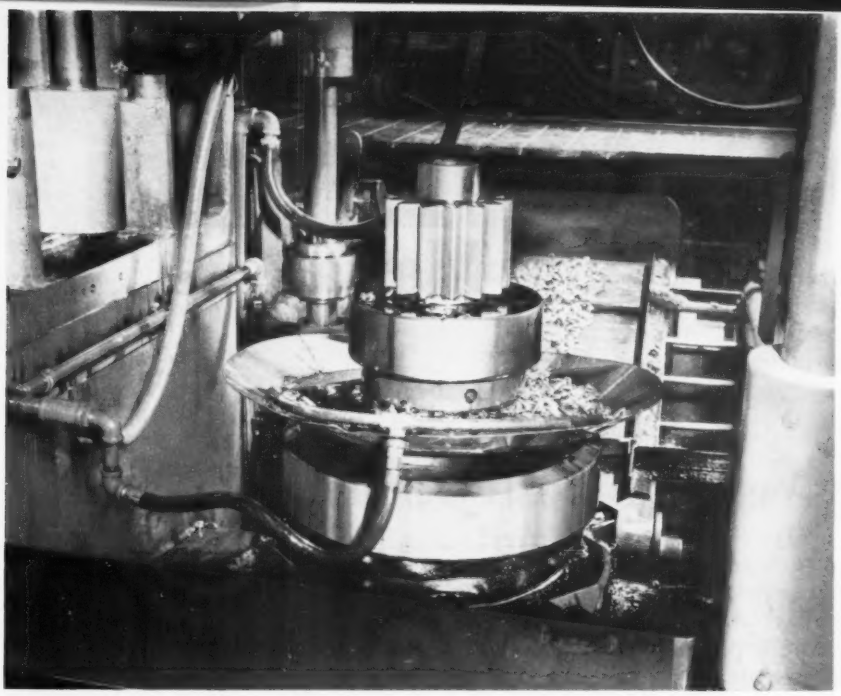


Fig. 11. (Left) Shear-Speed gear shaper cuts all teeth simultaneously. Production of final drive cluster gears has been increased as much as 1500 per cent

Fig. 12. (Below) Final drive gear, 30 1/2 inches in diameter by 5 inches wide and having fifty-nine teeth of 1.9636 diametral pitch, is crown-shaved on this machine. The cutter is behind the gear.

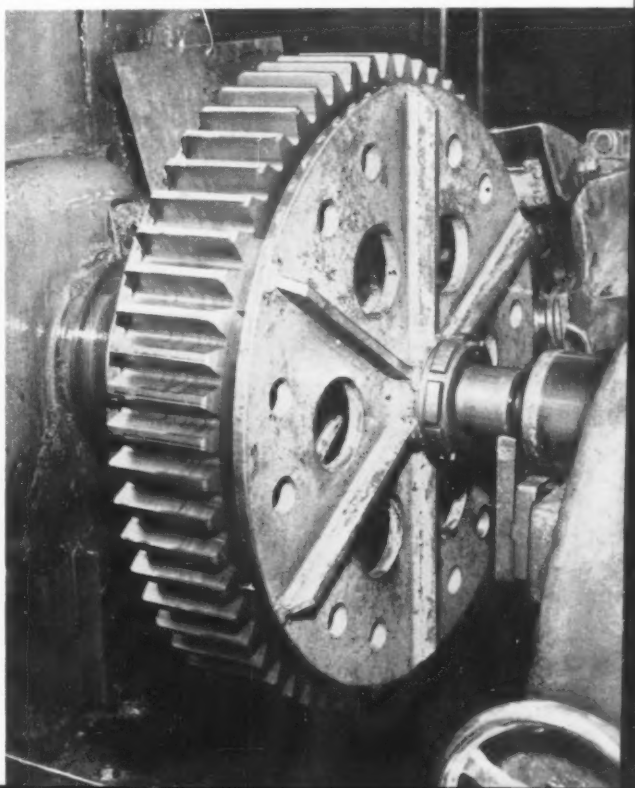
inches) is shaped on the machine seen in Fig. 11. The larger gear of the cluster, having thirty-three teeth, a diametral pitch of 2.7, a face width of 3 3/4 inches, and an outside diameter of 12 3/4 inches, is cut on a similar machine.

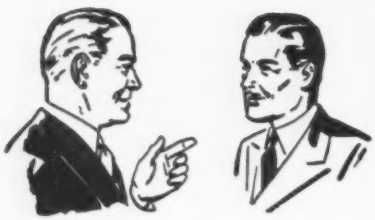
The gear blank is manually placed on a vertical arbor and hydraulically located and clamped. A double cone-shaped tool-head located above the work carries the same number of radially mounted, formed cutting tools as there are teeth to be cut in the gear. These tools are fed inward at the rate of 0.005 inch per stroke, while the work-piece is reciprocated, until the full tool depth is reached. During the downward or return stroke of the work, the tools are automatically retracted by means of a cam to avoid tool drag marks. Reciprocation of the work is variable from twenty to thirty-seven strokes per minute.

Final drive gears for the D9 Caterpillar tractor are steel forgings (SAE 1042), 30 1/2 inches in diameter by 5 inches wide, and having fifty-nine teeth of 1.9636 diametral pitch. The teeth of these gears are crown-shaved on the huge Red Ring rotary gear shaving machine shown in Fig. 12. This machine has a capacity for crown-shaving both spur and helical gears up to 12 inches wide by 52 inches in diameter, and having a diametral pitch from 2 to 16.

The gear is placed on an arbor and mounted between headstock and tailstock centers. Crown-shaving is accomplished by rocking the work-holding table about a center pivot while the gear is power-driven in mesh with a gashed cutter, carried on a head mounted on the saddle at the rear of the machine. The 1-inch wide, rotary gear-shaving cutter is reciprocated while it is driven by the work, and fed into the gear in adjustable increments of from 0.001 to 0.003 inch at the end of each cutter stroke. The cutter is meshed with the gear being shaved in crossed-axes relationship, and direction of work rotation is reversed at the ends of each stroke to insure uniformity.

Work speed can be varied from 25 to 398 R.P.M., and the reciprocation rate changed from 0.181 to 3.750 inches per minute. Stock removal is about 0.005 inch. An elliptoid tooth form is produced, having slightly thinner sections at the ends of the tooth than in the central position.





Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Product Versus Industry Selling

"Should we classify and assign our sales engineers to types of equipment sold, according to industries served, or simply by market areas? A pending merger that will increase our product lines has aroused sharp differences among our officials on marketing policies."

Many factors affected a response to this sales manager's inquiry. The question is one that is of current importance. It is increasingly necessary to fashion salesmen's qualifications so as to match the changing interests and practices of the buyer.

To reach a degree of realism, let us start from theory. The following five conditions give a perfect setting for sales performance. The sales engineer should:

1. Be an expert on each product he sells—its design, construction, operation, and maintenance;
2. Be familiar with all of his own company's services;
3. Have a deep and intimate technical and economic knowledge of the customer's processes;
4. Have undivided responsibility for his company's relations with the purchaser; and
5. Be conveniently located to all his customers.

Of course these five conditions could never be met short of Shangri-La. Types and sizes of equipment multiply. Customers' manufacturing processes increase in variety and complexity. As corporations grow, buying points spread. Granting an improvement in the ability of the sales engineer, he is unable, single-handed, to keep pace with the enlarged needs for knowledge and skill.

As specialization and diversification mark the advance in market demand, they likewise mark necessary realignment and reassignment in responsibilities and duties of sales engineering personnel. Many a sales manager is puzzling over the course to follow in reorganization. At first glance, narrowing and sharpening the work of each sales engineer is highly inviting. But before long, there appears a pressing need for coordination and integrated performance.

In an attempt to suggest common ways to approach a reclassification of sales effort, let us pinpoint existing trends. Product selling, or the classifying of salesmen according to the products they sell, is on the increase. This trend matches the assignment of purchasing engineers to product groups and their enlarged technical knowledge. The buyer rightfully insists that the salesman be an expert on the product he sells. Many corporations have discovered that greater efficiency results from concentrating sales attention and sales time directly in relation to physical objects sold.

Industry selling, or the concentration of sales effort according to the major customer industries served, is still considered sound in principle. Prospects still need help in solving application problems, but the tendency now is to highlight the process.

Sales managers increasingly attempt to solve the need for both product and industry selling in the following way. The rank and file territorial sales engineers are classified according to a product criterion. Sales engineers assigned to processes are stationed at headquarters or other strategic points from which they range to meet appropriate points of call. Though they live and work within the environment of the industry or character of process they serve, they team up with the product salesmen on some of the more involved negotiations.

Many equipment sales managers will benefit from a careful review of classifying and assigning salesmen. Key accounts can well be consulted to find out how they prefer to buy. The greatest danger to a rigid system of product selling is contained in your answer to this question: "Would you rather sell the product or sell the customer?" If you sell only the product, selling may be short-lived. Top salesmen sell the customer, but in order to excel, they need to concentrate on products.

TOOL ENGINEERING Ideas

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Chuck Protects Spherical Surface from Being Marred

By W. M. HALLIDAY, Southport, England

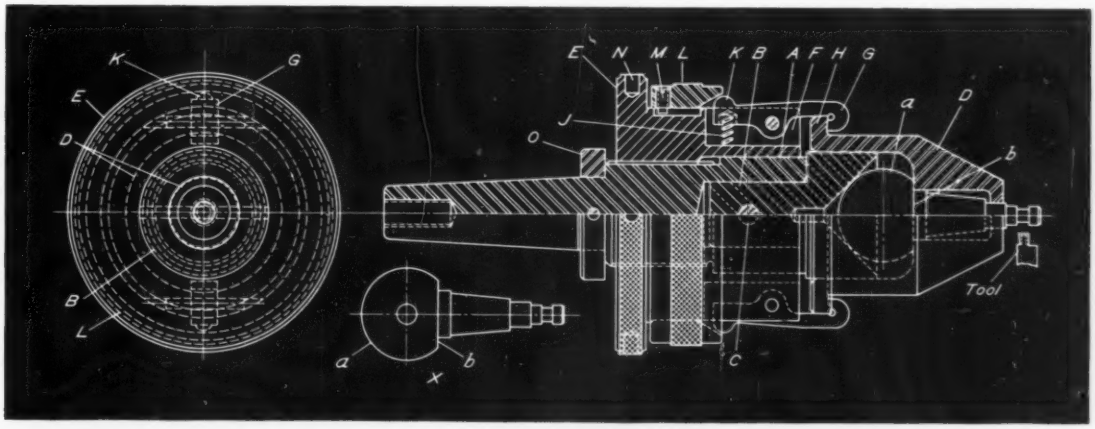
After a large quantity of die-castings having spherical heads had been produced, a change in design was made. The change involved a lathe operation to produce an annular groove on the shank of the work. A chuck, here illustrated, was built to hold the work without marring the head.

The chuck is mounted on a lathe spindle and tested for trueness by indicating body diameter *A* or brass plug *B*. This plug, which is permanently retained in the steel body by pin *C*, has a 90-degree conical seat matching head *a* of work-piece *X*. The work-piece is placed shank first into nose *D* which is then fitted over the plug and pressed inward until the head is seated in the recess.

Three internal diameters of the nose fit over the outside of the plug and work-piece. Thrust of a wall inside the nose on shoulder *b* maintains the head against the plug. It can be readily seen that this holding method prevents marring the head, yet centralizes it properly.

The left end of the body is threaded to receive a steel sleeve *E* which is bored cylindrically for about half its length on the right-hand end to a sliding fit over the forward part of the body. Two slots *F* provide swiveling space for pivoting fingers *G*. These fingers have hooked ends to engage a flange *H* on the nose. Coil springs *J* between the ends of the fingers and the bases of the slots assist the fingers to engage the flange. Each finger also has a node *K*, used to retain the member in a disengaged position when the inclined surface on the right-hand side of ring *L* passes over the nodes. This ring fits a reduced diameter of the sleeve.

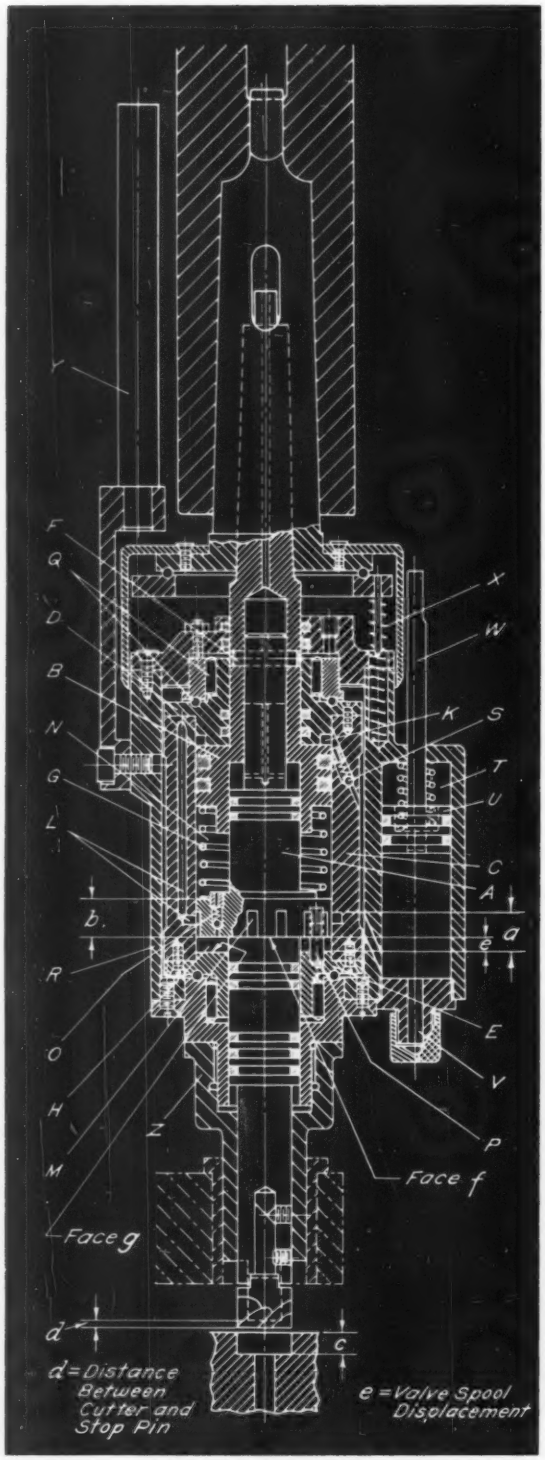
After the work-piece is seated, the ring is moved to the left, allowing the fingers to engage the flange. (Set-screw *M* in the sleeve limits the amount of sliding movement of the ring.) The sleeve is then screwed to the left, securing the nose to the plug. Around the end of the sleeve are four spanner-wrench holes *N*. Collar *O* pinned to the shank serves to restrict the axial movement of the sleeve.



Lathe chuck that seats and holds a die-casting without marring its spherical head.

Hydraulic Boring Head Designed to Eliminate Vibration and Absorb Cutting Load

By T. R. GOULDEN, Lanarkshire, Scotland



Hydraulic boring head which reduces vibration and excessive cutting load when controlling the depth of cut with the automatic cut-off unit on a boring machine.

When utilizing the automatic feed cut-off device on a boring machine to control the depth of cut, a certain amount of vibration and excessive loading are usually encountered. These factors can be kept to a minimum and accuracy increased by using the hydraulic boring head shown in the accompanying illustration. Connecting holes and scallops, which provide for the passage of oil through the chambers of the boring head, control the movement of its pistons and valves. This head has a valve spool *A* nested in piston *B*. Both spool and piston slide in valve cylinder *C* and cylinder caps *D* and *E*. The spool is slotted for pin *F* which transmits the drive from piston *B*. Spring *G* extends the valve spool to its normal position. Chambers *H* and *K* are connected by radial scallops and holes *L*.

Care must be taken to locate the scallops so that dimension *a* exceeds dimension *b* by approximately half the amount of the tolerance allowed on the depth of the bore to arrive at the mean tolerance. Slots *M*, milled on the large diameter of the valve spool, permit free passage of oil from the lower chamber to the upper chamber through these scallops and holes. Oil also passes from the lower chamber into the middle valve chamber *N* through ball valve *O*. The drive between cylinder *C* and the valve spool is provided by pin *P*. The entire assembly rotates on ball and roller bearings *Q* in oil reservoir *R*. Oil passes from the reservoir into the upper chamber through ball valve *S*.

A supply of oil is insured from cylinder *T* by a spring-loaded piston *U*. Oil is added to this cylinder through connection *V* as indicated by gage *W*. A series of springs *X* encircle the upper portion of the reservoir and, pushing against a thrust bearing, expand the unit to maintain piston *B* in its normal position. Pin *Y*, secured to the machine head, prevents the reservoir casing from turning. A stop and guide bushing *Z* is located on the lower end cap of the reservoir.

In operation, the edge of the cutting tool, centered by the locating bushing, is set so that *c* (the depth to be machined) is equal to *d* plus *e*. The mechanical stop is then set to maintain this dimension. With the machine spindle rotating and the feed engaged, the unit is advanced toward the work-piece. As the tool starts to cut,

the spindle drive is transmitted through pin *F*, and the cutting force is supplied by the oil pressure in the middle chamber. When the stop bushing Z reaches the work-piece and the tool point is at depth *d*, the outer casing of the reservoir and the valve cylinder *C* cease to advance. The valve spool, piston *B*, and the cutting tool continue to move downward. This displaces oil from the lower chamber into the upper chamber through slots *M* and the scallops and connecting holes. The volume of oil in the middle chamber remains unchanged. At the same time, springs *X* are being compressed as the machine spindle moves toward the reservoir casing. The cutting stroke continues until face *f* meets face *G*.

At this point, the cutting depth is reached, and the inner chamber is open to the scallops and connecting holes. The valve spool ceases its downward movement, but the piston continues to advance, and oil is displaced into the upper chamber from the middle chamber. No load is being applied to the work during this portion of the piston stroke. This additional motion of the piston which compresses spring *G* continues until the trip mechanism cuts off the feed and the unit reverts to normal position. Spring *G* then displaces the valve spool and permits oil to flow from the lower chamber through valve *O* into the middle chamber. Springs *X*, in turn, displace cylinder *C*, causing oil to flow.

Using a Threaded Mandrel to Rebuild a Lead-Screw Half-Nut

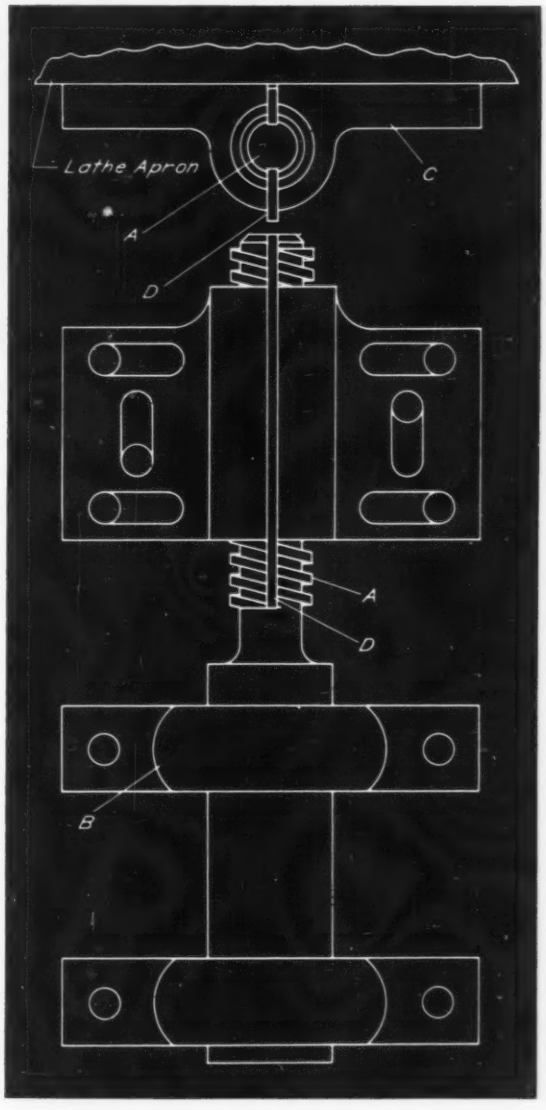
By J. RANDOLPH LUCAS, RICHMOND, VA.

On many lathes, the lead-screw half-nut has a threaded section poured of babbitt or a similar low melting temperature metal. After a period of use, these threads become worn and need replacing. One method of rebuilding a half-nut is here illustrated.

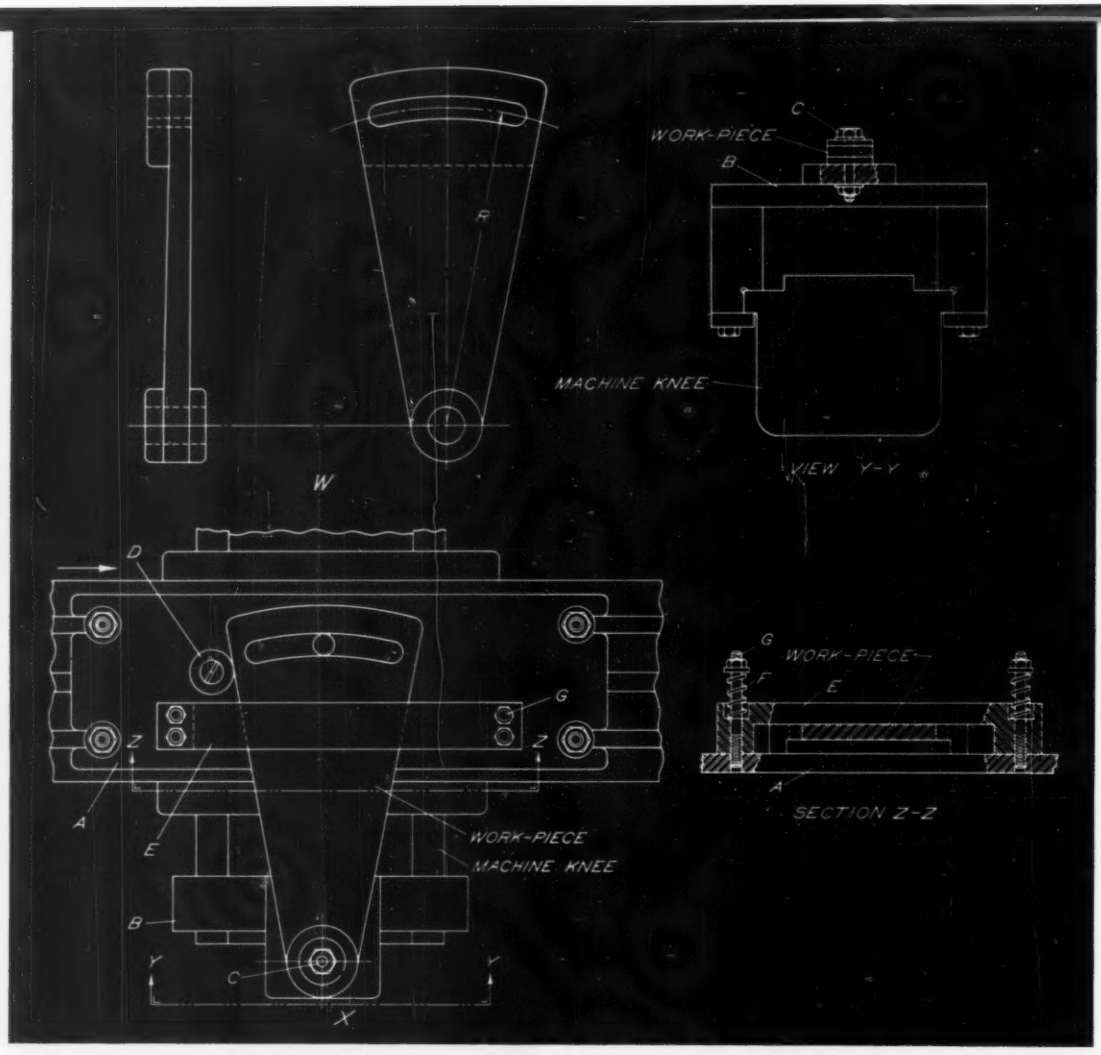
Use is made of a threaded mandrel *A* which can be machined of steel or cast iron. One end is turned to a good fit in apron-mounted bearings *B*, and the other end is threaded the same as the lead-screw. Two slots are milled in the threaded end of the mandrel. The width of these slots is determined by the distance between the two sections of the half-nut *C* when in the closed position.

The mandrel *A* is set up as shown, and two pieces of flat stock *D* are inserted in the openings of the closed half-nut. These pieces should be allowed to extend into the slots. The lower end of the half-nut is sealed with asbestos paste or a similar material. The parts are heated, and babbitt is poured around the mandrel threads. Keys *D* are then withdrawn, and the mandrel is removed from the half-nuts. Any metal that may have leaked past the keys should be removed by filing.

This procedure may be used on lathes with one or more apron-mounted bearings having centers coincident with the axis of the lead-screw. Such bearings are normally used to support either the lead-screw or the gears that drive the cross and longitudinal feeds.



Threaded mandrel used to rebuild the lead-screw half-nut of a lathe.



Simple milling fixture for sector-shaped weldment that facilitates machining of curved slot.

Fixture for Milling Curved Slots without Rotary Table

By H. J. GERBER, Stillwater, Okla.

Milling a curved slot in a small quantity of large, sector-shaped steel weldments presented a problem in a shop where a suitable rotary table was unavailable. The illustrated fixture, designed for a vertical milling machine, utilized the motion of the machine table to pivot the weldment about a locating point on a stationary bracket.

At W can be seen the part to be machined. The slot is located from the center of a shaft hole previously bored through the hub. Baseplate *A* of the fixture, which is shown at X, is bolted to the milling machine table. A welded bracket arrangement *B* is machined to permit clamping to the knee of the milling machine (view Y-Y).

Bolt *C*, of the same diameter as the hole in the work-piece hub, passes through the part and serves as a pivot point. The bolt is secured to bracket *B*. Steel roller *D*, which is fastened to the baseplate, contacts the side of the part. Instead of a steel roller, a ball bearing may be used.

To retain the sector against the baseplate, a spring-loaded hold-down bracket *E* is used. This channel-shaped member, which can be seen more clearly in section Z-Z, is held firmly against the surface of the work-piece by four die-springs *F*, supported by four studs *G*.

Before the part is mounted in the fixture, it should be coated with either grease or heavy oil. After mounting, the milling machine table is adjusted to bring the cutter to the desired radial distance from the pivot point, and at the right-hand extremity of the slot to be machined.

When the table feed is engaged in the direction indicated by the arrow, roller *D* will bear against the work-piece and cause it to swing around bolt *C*. The nuts on studs *G* can be adjusted to alter spring tension on bracket *E*, thus providing a means of eliminating chatter.



MACHINERY'S PROBLEM CLINIC

Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

Accuracy of Numerical Computations

Some of the letters received by this department contain mathematical calculations that are numerically inaccurate due to either incorrect rounding of figures or a lack of knowledge of how to evaluate the accuracy of approximate calculations.

Considering the importance of accuracy in formulas and ordinary arithmetical computations, some knowledge of methods used to minimize inaccuracies is essential.

It may be said that all figures representing measurements or obtained from computations in which measured values are used are approximations. The more accurate the measuring instrument, the more skillfully it is used, the more accurate will be the resulting measurements. But, nevertheless, they are still approximations and should be recognized as such. Thus, whenever measured values are to be used in mathematical computations they should be expressed in such a way as to indicate their accuracy.

If a measurement is 5 inches to the nearest thousandth of an inch, it should be written as 5.000 inches—not 5 inches. If a measurement is 3.9 inches to the nearest ten-thousandth of an inch, it should be written 3.9000 inches—not 3.9 inches. In other words, zeros should be inserted, where required, to the number of decimal places which indicates the accuracy of a given figure.

Rounding off Figures. Where a figure represents a highly accurate measurement but is to be used in a computation where such an accurate value is not required, the figure may be rounded off. Thus, if a measurement were 5.2391 inches and a value to the nearest thousandth were satisfactory for the computation in question, it would be written 5.239; if only to the nearest hundredth, then 5.24; if only to the nearest tenth, then 5.2.

In setting up rules for rounding off decimals there are three general cases to be considered:

Rule 1. When the figure next beyond the last figure or place to be retained is less than 5, the figure in the last place retained should be kept unchanged.

Example: 1.2342 1.234 1.23 1.2

Rule 2. When the figure next beyond the last figure or place to be retained is more than 5, the figure in the last place retained should be increased by 1.

Example: 1.6789 1.679 1.68 1.7

Rule 3. When the figure next beyond the last figure or place to be retained is 5 and (a) there are no figures or only zeros beyond this 5, if the figure in the last place to be retained is odd, it should be increased by 1; if even, it should be kept unchanged; (b) if the 5 next beyond the figure in the last place to be retained is followed by any figures other than zero, the figure in the last place retained should be increased by 1, whether odd or even.

Example (a)		*Example (b)*	
1.35	1.4	1.3501	1.4
1.3500	1.4	1.3599	1.4
1.45	1.4	1.4501	1.5
1.4500	1.4	1.4599	1.5

It should be noted that when more than one digit is dropped by rounding off, the final value is obtained by dropping all digits beyond the last digit to be retained and following the rules given above—and not by a series of successive roundings in which one digit is dropped at a time.

For example, when 0.5499 is rounded off to one decimal place it becomes 0.5 and not 0.6 as it would if successive roundings were applied.

The subject of accuracy in numerical computations will be continued in a future number of MACHINERY.

LATEST DEVELOPMENTS IN *Shop*

Ex-Cell-O Grinder for Finishing Operations on Jet-Engine Vanes

A three-slide grinder which automatically finishes the curved surfaces at the roots of jet-engine vanes has been designed and built by the Ex-Cell-O Corporation, Detroit, Mich. The general arrangement of this machine and its equipment is shown in Fig. 1. The heavy lines in the diagram, Fig. 3, indicate the five surfaces ground on the vanes in one operating cycle.

The vanes are held in a trunnion fixture, as may be seen in the close-up view, Fig. 2. Two of these fixtures are furnished with the machine. While one fixture is rotating and carrying its load of

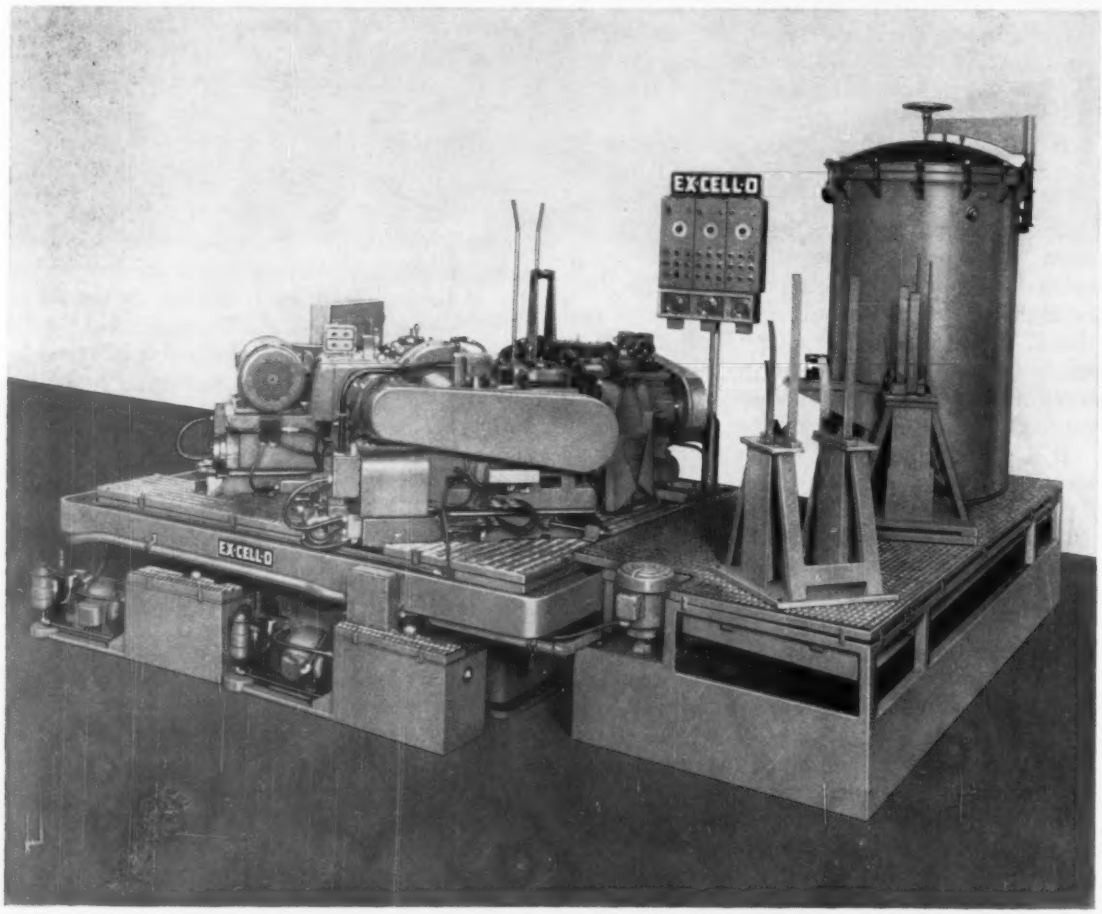


Fig. 1. Three-slide grinder and auxiliary equipment developed and built by the Ex-Cell-O Corporation for rapid, precision processing of jet-engine vanes

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

vanes through the grinding cycle, the other is being loaded by the operator. Thus, the two interchangeable trunnion fixtures facilitate practically continuous operation. The fixture seen in Fig. 2 holds nineteen vanes, but the number of vanes ground per machine cycle can be varied, depending upon the size and shape of the vanes. Loading racks shown on the platform at the right, Fig. 1, support the trunnion fixtures when they are removed from the machine.

The machine is equipped with four grinding wheels mounted on three spindles. Two of the wheels mounted on their own individual spindles can be seen in the right foreground in Fig. 2, while the other two wheels mounted together on the same spindle appear in the upper left background area. Three of the wheels are 15 inches in diameter, and the fourth is 20 inches in diameter.

The slides carrying the grinding wheels and their spindles are so positioned and operated that the curved surfaces on the jet-engine vanes are accurately and automatically finished as the rotating trunnion fixture carries the workpieces past the precision-located grinding wheels.

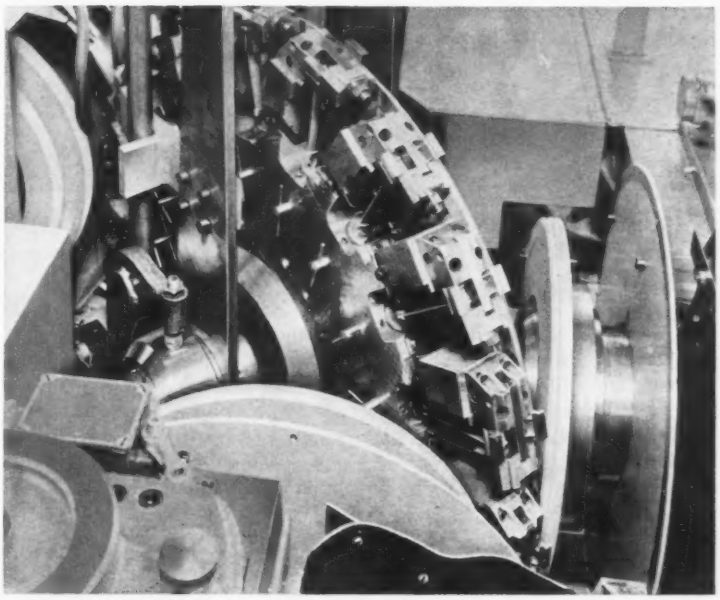


Fig. 2. Close-up of work-carrying trunnion fixture and grinding wheels of machine shown in Fig. 1

Each slide is equipped with a cam type, universal diamond dresser which shapes the respective wheels as part of the automatic machine cycle. The slides automatically compensate for the abrasive removed when the wheels are dressed. Slide movements include rapid approach, adjustable fine feed, and an adjustable spark-out period.

Circle Item 101 on postcard, page 239

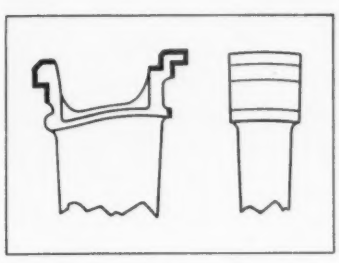
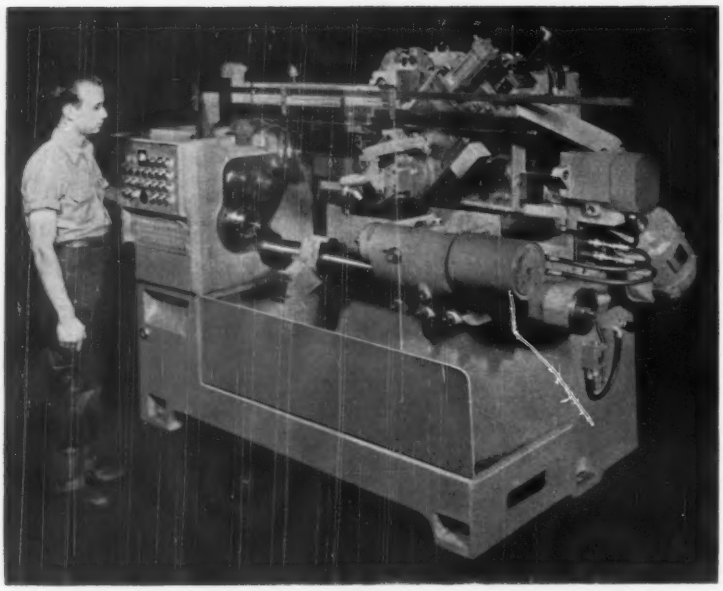


Fig. 3. Diagram showing surfaces of vanes finished on Ex-Cell-O grinder

Norton Abrasive Spheres for Tumbling-Barrel Finishing

The Norton Co., Worcester, Mass., has announced a new barrel-finishing material called Tumblex "S" which consists of abrasive spheres available in five different diameters. These spheres are made of Norton Alundum aluminum oxide abrasive. The abrasive spheres are said to be ideally suited for barrel finishing hard-to-contact recesses or intricate shapes. They have proved satisfactory for finishing tubing, coil springs, scissors handles, bearing retainers, pump bodies, and many other parts where conventional abrasive tumbling materials tend to wedge or fail to reach all the surfaces to be finished. The spheres are exceptionally dense and long lasting.

Circle Item 102 on postcard, page 239



Hydraulic multi-cycle tracer lathe made by Sundstrand Machine Tool Co.

Sundstrand Hydraulic Multi-Cycle Tracer Lathe

A hydraulic, multi-cycle tracer lathe designed for rapid, economical machining of irregular shapes is announced by the Sundstrand Machine Tool Co., Rockford, Ill. Only one template is required for multi-cycle cuts. Two roughing cuts, a semifinish, and a finish cut may be obtained in one automatic cycle. An indexing tool turret permits the use of two cutting tools, one for roughing and one for finishing. Shoulder-facing tools can be provided, if desired, for squaring operations.

The stylus, template, and workpiece are in full view from the operator's normal position. Front loading lends itself to easy handling and can be adapted for automatic handling mechanisms. With the tracer controls and stylus on the top carriage, chips and dirt will not accumulate on the template and impair machining accuracy.

The transmission head is available in a 2-, 4-, or 8-speed type. Automatic speed changes are provided for all cuts of a cycle with each type head. Proper spindle speed for the best surface finish and feed is automatically maintained at all times.

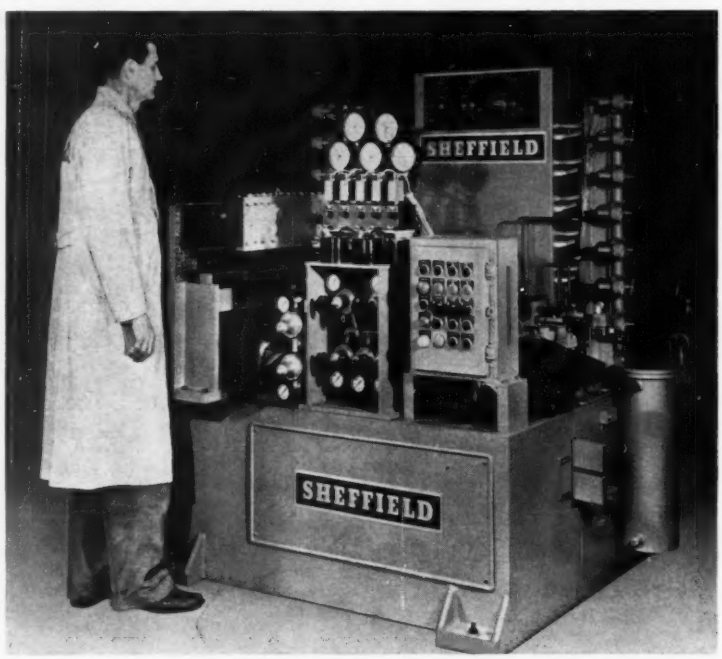
A direct-reading scale is provided for fast and accurate positioning of the tailstock. All controls and adjustments, including the template bar or holder for setup and tool wear, are within easy reach of the operator from the normal working position.

Circle Item 103 on postcard, page 239

Sheffield "Multi-Feedbak" Unit Combining Gaging and Machine-Control Feed-Back

The Autometrology Division of the Sheffield Corporation, Dayton, Ohio, assigned to research and manufacture of automatic dimensional gaging systems for automated precision industries, has announced the development of a "Multi-Feedbak" device combining multiple automatic gaging and feed-back machine control in a single unit.

The "Multi-Feedbak" is made to adapt individual size and machine-control feed-back units to each machine of a series to achieve precise, high-speed measurement of the parts being produced by the machines. It consists of gaging equipment with provisions for receiving and measuring precision parts from each machine of a series comprising the automated production line. Individual parts are conveyed through the automatic gaging control system by a series of part-handling devices. A "memory system" positions the incoming parts in gaging stations, one at a time, as they flow from the machines.



"Multi-Feedbak" device developed by the Sheffield Corporation to combine automated precision gaging and machine-control system in one unit

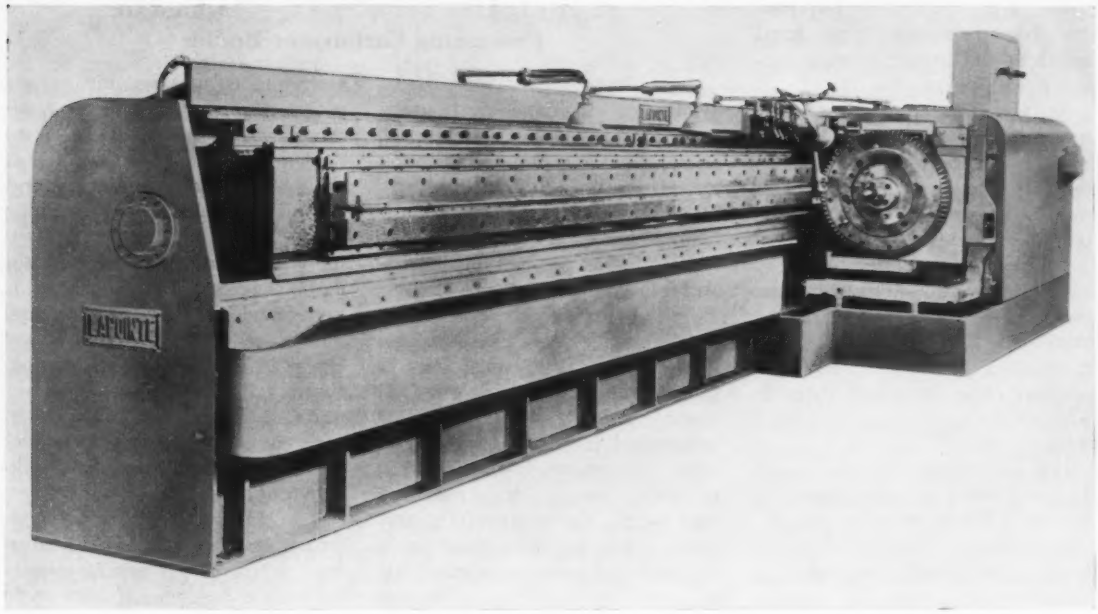


Fig. 1. Lapointe single-ram, horizontal electromechanical broaching machine

Controls go into instant action as each part is being inspected. Electrical gage signals received from the part are transmitted to the particular machine that produced the part. Thus, these signals serve to anticipate and make corrections by loop feed-back size control.

In cases where all parts passing through the gaging control unit are not quite the same, two gaging stations are incorporated into the device. Where basic dimensions are the same but over-all size is different, a primary gage station inspects the basic dimensions and a series of secondary stations inspect the variable dimensions of the part. Here the memory system performs the additional job of determining which secondary gage station will inspect the part after it leaves the primary station.

The memory system may also be used for a third dimensional quality control function—that of segregating acceptable parts into individual lanes or chutes corresponding to the various types of parts to be produced. "Multi-Feedbak" installations controlling as many as twenty, or more, machines at the same time are in use.

Circle Item 104 on postcard, page 239

Giant-Size Broaching Machine

A huge broaching machine, said to be the first of its type to enter the giant class of machine tools, has been developed by the Lapointe Machine Tool Co., Hudson, Mass. This 50-foot machine, Fig. 1, broaches pine-tree holding slots in the periphery of gas-turbine wheels, such as the one seen in Fig. 2. Slots 1.6 inches deep are broached in rims up to 5 inches thick, removing 150 pounds of metal per wheel. The actual broaching time on one of the big form wheels having ninety slots is two and one-third hours. Two

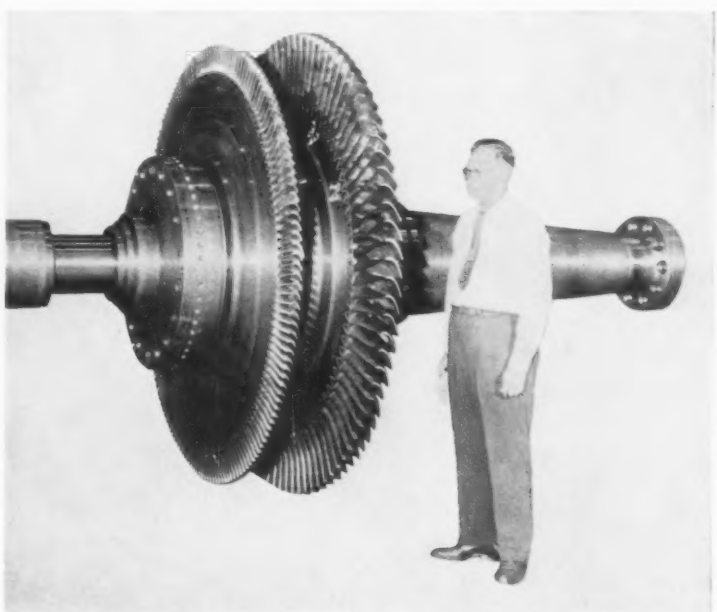


Fig. 2. Completed gas-turbine wheel after blades have been assembled into slots broached by machine shown in Fig. 1

passes of the broach are required for this operation. The total length of the broach cutting section is 450 inches.

By changing broaching tools and using adapter plates on the indexing fixture, both turbine and compressor wheels are broached on the same machine. The range in the diameters of the wheels broached on the Lapointe indexing fixture is from 40 to 80 inches, and the number of slots ranges from 30 to 150. Indexing is held to within 0.0002 inch of the true position. The broached form is held within a tolerance of 0.0003 inch.

The broaching machine is of steel-weldment construction and weighs 150,000 pounds. Adjustable voltage, 100-H.P. broach-driving equipment operates a 16,000-pound slide to assure smooth cutting action, increased tool life, and exceptionally fine finish.

Circle Item 105 on postcard, page 239

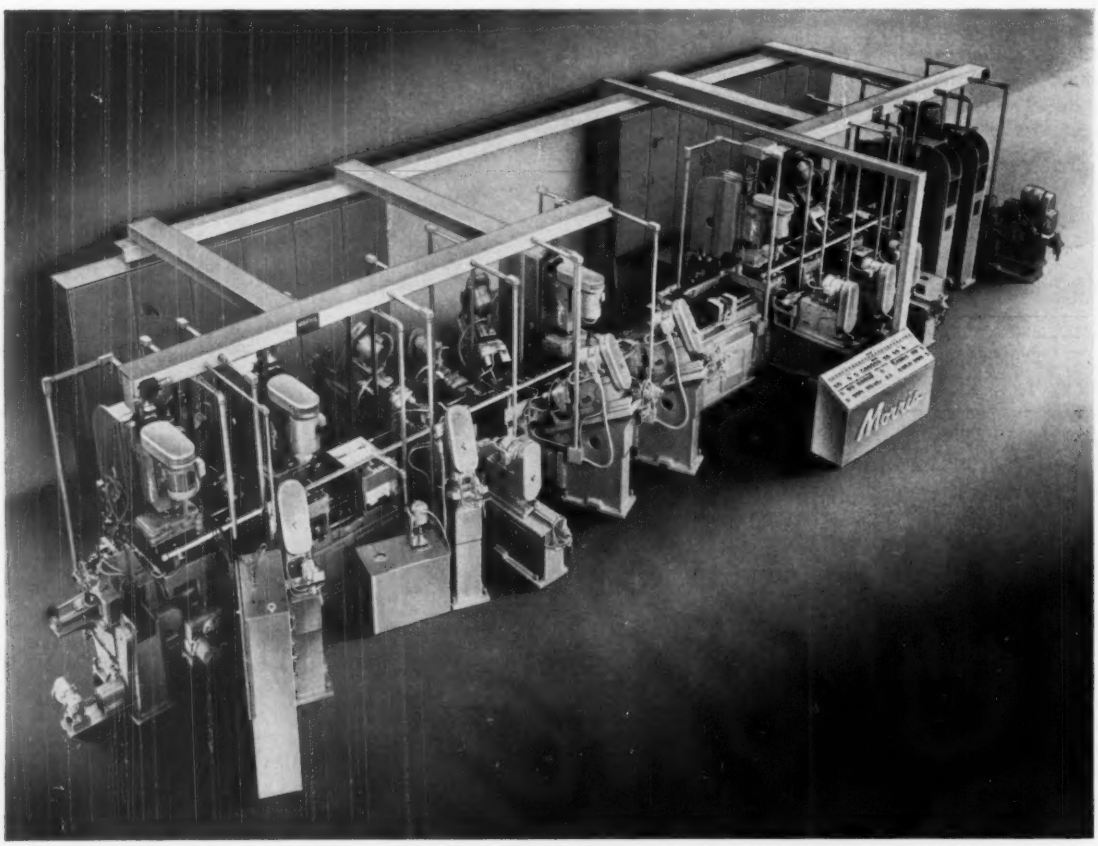
Morris In-Line Transfer Type Machine for Processing Carburetor Bodies

An in-line transfer type, high-production machine that automatically completes one part every seven and one-half seconds has just been built by the Morris Machine Tool Co., Cincinnati, Ohio. This machine is designed for use in the production of two- and four-barrel carburetor bodies. Twenty-five standard Morris production units, including fourteen No. 1 Cam-matic, seven No. 2 Cam-matic, and four Air-Oil-Matic Morris drill units are incorporated in this machine. The units perform thirty-one drilling, nineteen boring, ten reaming, four gaging, thirteen probing, and thirteen tapping operations, making a total of ninety operations for the complete machining of a carburetor body.

The machine processes 480 parts per hour, employing fifty-six stations. An automatic loading section checks parts and rejects pieces that are incorrectly positioned. Precision locator holes are drilled and gaged for accuracy at the first station. Both the first and second sections of the machine can be operated either individually or as a single unit. Automatic loading and unloading is performed in the center section, where automatic storage also may be provided. After machining, there is automatic delivery of parts to the unloading conveyor. Drill units are mounted on power driven sliding sub-bases to facilitate tool changing.

The Morris "Unit-Type" construction employed for this transfer machine is economically adaptable for almost any type product requiring multiple drilling operations on a mass-production basis.

Circle Item 106 on postcard, page 239



In-line transfer machine for processing carburetor bodies built by the Morris Machine Tool Co.

Garvin Automatic Tapping Machines

Multi-speed automatic tapping machines built in five different sizes are announced by Western Machine Tool Works, Holland, Mich. All sizes operate on essentially the same principle; one simple pull on the operating lever causes the tap to enter the predrilled hole, tap to the depth required, reverse, and back out in preparation for another cycle. Reversal of the tap rotation is instantaneous—no stripping of the last thread occurs. The machines can be arranged for both right- and left-hand tapping, but right-hand tapping is standard.

The five machines cover a tapping range of from 1/16 inch to 3 1/2 inches in cast iron and from 1/16 inch to 2 3/4 inches in SAE X-1020 steel. Holes tapped by these machines range from 1 1/2 to 2 1/2 inches in depth. The smallest machine has three spindle speeds ranging from 300 to 600 R.P.M., or an optional range of 450 to 900 R.P.M. This machine has a net weight of 650 pounds. The four larger machines have four spindle speeds, the largest "Hi-Power" size having a range of 72 to 189 R.P.M., or an optional range of 35 to 91 R.P.M. This machine has a net weight of about 2075 pounds.

The third, or middle-size, machine has a plain, bronze bearing spindle. All other sizes are equipped with Timken roller bearing spindles. All tables of these machines are adjustable for height and have T-slots arranged to facilitate accurate mounting of work-fixtures.

Circle Item 107 on postcard, page 239

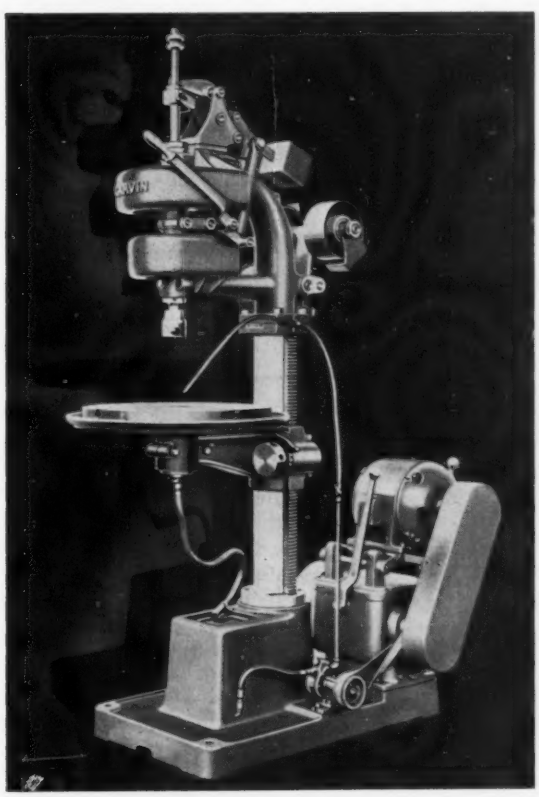
High-Production Flat-Finishing Machine

Hammond Machinery Builders, Inc., Kalamazoo, Mich, has brought out a Model FF-12 flat finisher designed for wet abrasive-belt grinding, polishing, and deburring of flat work such as sheets, strip, bars, stampings, and plates up to 12 inches wide and 6 inches high. Continuous feeding of work within this capacity range is accomplished through a variable-speed, air-tensioned endless conveyor.

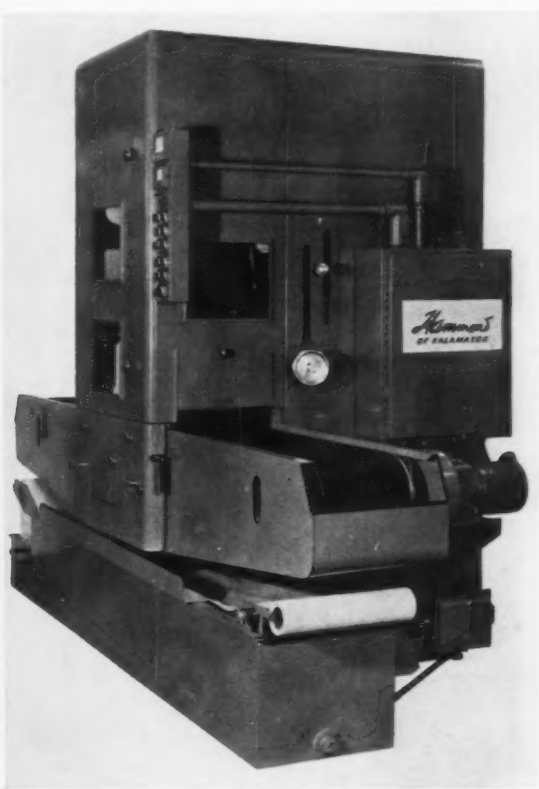
The head of the machine is of two-roll design, employing an abrasive belt 12 inches wide by 126 inches long. It consists of a large-diameter, air-tensioned tracking idler pulley, a heavy dovetail slide for work height adjustment, and a contact roll driven by a motor having a power rating of up to 25 H.P.

Other features and optional equipment include power elevation for head adjustment to the work; 6- to 10-inch diameter contact rolls; adjustable work hold-down rolls; magnetic conveyor platen; and automatic coolant filter.

Circle Item 108 on postcard, page 239

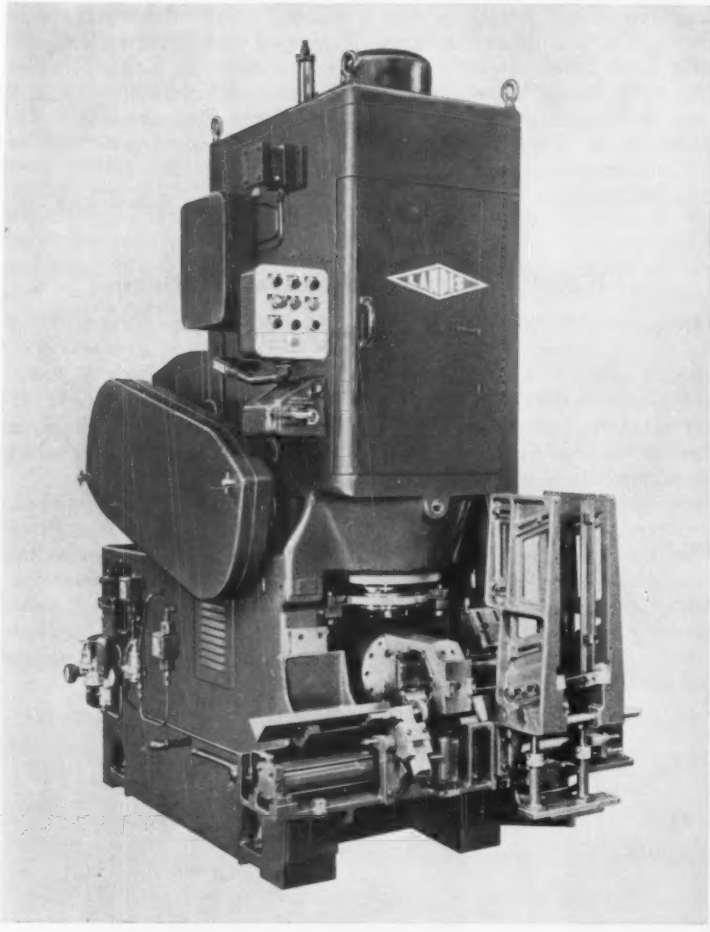


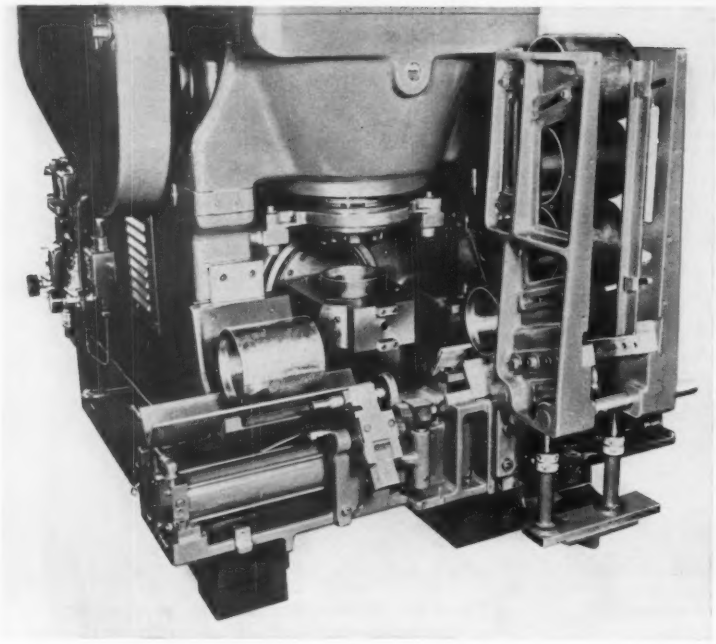
Garvin automatic tapping machine of line announced by the Western Machine Tool Works



Hammond abrasive-belt grinding, polishing, and deburring machine for finishing flat work

Landis Automatic Coupling Tapping Machine





A tapping machine designed for high-production, precision internal threading of couplings for oil-handling tubing and casings has been brought out by the Landis Machine Co., Waynesboro, Pa. This pneumatically operated, electrically controlled machine, designated 48 T, features automatic operation with magazine feed. It has the capacity for tapping couplings ranging from the 1 1/4-inch tubing size up to the 6-inch outside diameter casing size. Features include variable-spindle float and receding chaser tap mechanism designed to assure threads of precision taper with infinite settings from 3/4 inch to 0 taper per foot; detachable tap heads for wide range coverage with minimum tooling cost; lead-screw feed; precision worm and worm-wheel drive; integral spindle and tap unit; and rugged-compact construction.

Production rates at 100 per cent efficiency range from ninety-six per hour on 1 1/2-inch line pipe couplings to seventeen per hour for 5 1/2-inch casing couplings. Standard merchant, conduit, and many special couplings can be tapped on a high-production basis, and the machine can also be set up for straight-through tapping and single indexing. When using a constant-speed motor, spindle speed changes are accomplished by changing the V-belt drive pulleys. However, mechanical vari-drives and variable-speed motors are also available.

Circle Item 109 on postcard, page 239

Heller "Whizcut" File

A "Whizcut" file for smooth, fast cutting of the softer metals without chatter is being made by the Heller Tool Co., Newcomerstown, Ohio. This file has been found especially useful in smoothing the rough edges of acryilc sheets used in the con-

Fig. 1. (Above) Automatic coupling tapping machine brought out by the Landis Machine Co.
Fig. 2. (Left) Close-up of tapping and work-handling equipment

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Brown & Sharpe's "Thrifty Jo's" are available at your Brown & Sharpe Distributors. In sets of 84 or 36 blocks, or as individual, standard sizes. Thrift carbide wear blocks available for use as outer blocks. Send for Catalog of complete Jo-Block Line. Brown & Sharpe Mfg. Co., Providence, R. I.

For more information fill in page number on Inquiry Card, on page 239

struction of canopies for high-speed jet planes. The manufacturers point out that the new "Whizcut" file differs in two ways from other Vixen files. First, the milled-curved teeth are cut off-center to provide a variable degree of tooth angle and spacing from edge to edge on the file face. Second, ground-in chip breaking grooves serve to reduce chip size.

Circle Item 110 on postcard, page 239

Rockford Hydraulic Mill for Machining Aluminum Airframe Parts

A hydraulic, planer type airframe mill has been announced by the Rockford Machine Tool Co., Rockford, Ill. This mill is designed for fast, high-precision machining of variable and complex shapes, and especially to speed up machining of airframe parts. It can be furnished in heights of 30, 36, and 42 inches; widths of 30 or 36 inches; and with stroke lengths of 6, 8, or 10 feet. The hydraulic and electrical mechanisms are interlocked for maximum operater efficiency and protection for operator and work.

Both bed and table ways have been designed especially for tracer-milling control. The hydrauliic power unit has a 7 1/2 H.P. motor employing two tandem-mounted pumps—one for cross and longitudinal movement and one for vertical movement. The power unit also includes a heat exchanger with automatic temperature control to maintain constant oil viscosity for accurate duplication. A separate and independent 1-H.P. pumping unit is used to fully counterbalance the duplicating head.

The machine illustrated is equipped with a 15/30-H.P. 1800/3600 R.P.M. high-speed milling head. This head, which is supplied as extra equipment, has a "No. 50 National Milling Machine Taper and Draw Bar." The spindle is arranged with a Warner electric brake, and the head is water cooled and protected with pressure and thermal switches.

A three-dimensional tracer valve is mounted on adjustable slides for longitudinal, cross, and vertical adjustments for varying the relationship between cutter and stylus. An additional tracer valve, arranged with a four-position turret stop, is provided for variable depth control for 360-degree contour operations.

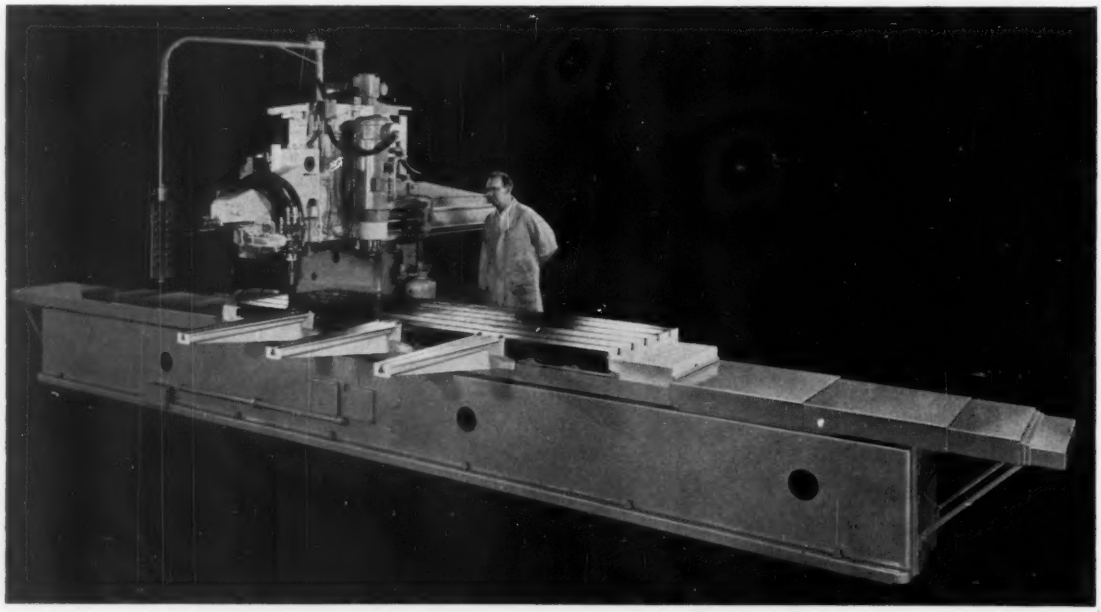
Circle Item 111 on postcard, page 239



Electric-erosion machine introduced by the Electro-Spark Co., Inc.

Electric-Erosion Unit for Machining Hardened Steels and Carbides

The Electro-Spark Co., Inc., New York City, is introducing in this country a Swiss-made, multi-purpose machine tool which is designed for rapid, low-cost machining and erosion-grinding of hardened steels and sintered metals by the electric-erosion process. The electrical and machining elements of this machine



Rockford hydraulic airframe mill equipped with high-speed milling head

Let's Talk about Tools and Money

Never in history has competition for the consumer's dollar been keener than it is right now.

In the face of mounting costs, the manufacturer is under continual pressure to turn out a better product at a lower selling price. Inevitably, this problem of producing more for less is laid squarely in the lap of production.

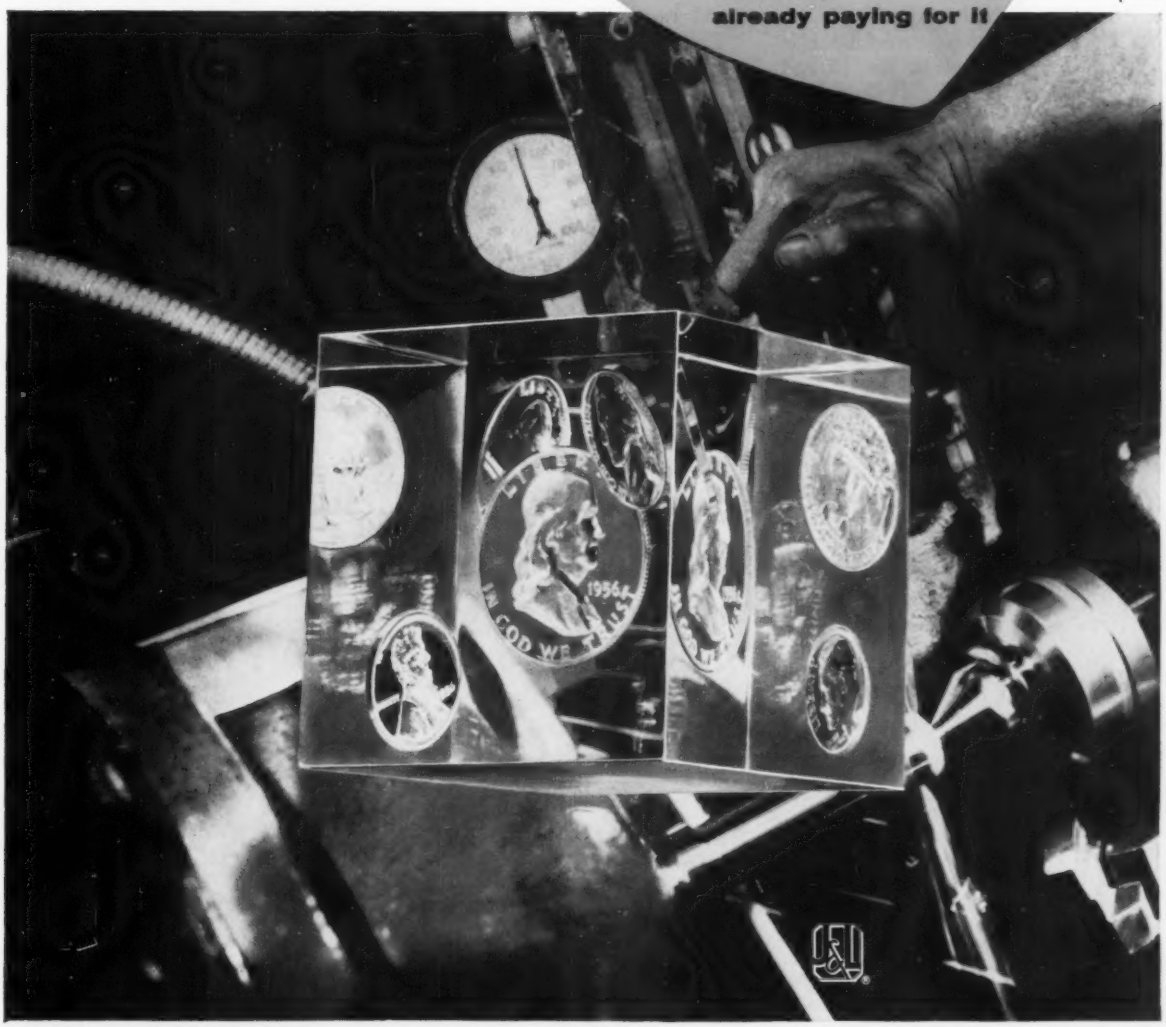
Quite obviously, when machine tool miracles are a "must", to tolerate outmoded equipment is to embrace disaster. Only the *most advanced, most efficient* machine tools can play a part in producing the marvels that *must* be wrought.

We invite you, as a member of production management, to study the following pages on which are shown representative J & L products. JONES & LAMSON MACHINE COMPANY, 512 Clinton Street, Springfield, Vermont.

JONES & LAMSON MACHINE COMPANY

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form a self-contained unit that is especially adapted for the production of precision metal stamping or drawing dies made of hardened steel or tungsten-carbide. An electrode of the form or shape to be machined in a die or other part is made from an electrical conducting material such as brass or bronze. The form of this electrode is then automatically machined in the work by concentrated electric arc discharges.

The precision work produced by this machine has a fine-polished appearance that requires no further finishing. Moreover, any die can be reworked without annealing. The coarsest rough surface as well as the finest polished bore, or formed contour, can be easily reproduced or duplicated. The machine can also perform surface or profile grinding operations on carbide tools and dies, always by electric erosion, using a copper instead of a diamond wheel. For this purpose, the electrode or wheel holder can be rotated, using an electric motor mounted on the head of the machine. The head can also be swung to a 30-degree angle on either side.

Doors provided on both sides of the machine make its interior readily accessible. The tank holding the dielectric can be lowered to leave the working table completely free so that the workpieces can be easily inspected.

Circle Item 112 on postcard, page 239

Tarex Single-Spindle Automatic Turret Lathe

A Swiss-built Tarex, single-spindle, automatic turret lathe is being introduced in the United States by Russell, Holbrook & Henderson, Inc., New York City. This versatile TAR/L model machine is intended for work of exceptional accuracy. It is available in three sizes having capacities for handling stock 1 1/4, 1 5/8, and 2 1/16 inches in diameter. The maximum chucking diameter capacity is 4 1/2 inches; the swing, 6 inches; and the spindle speed range, 55 to 4730 R.P.M.

The machine can be supplied with either a six- or eight-position turret built for single or double indexing.

Special supplementary units which can be added to the machine without fitting or scraping include: camshaft accelerator for reducing non-productive time; optional spindle speed units; universal spindle for either bar or chucking work and either mechanical, hydraulic, or pneumatic operation; single or compound front and rear slides; either one or two vertical slides; choice of two types of single-point thread chasing attachments, either a cam-operated device mounted on the front cross-slide or an independent type mounted on the front of the main machine casting; spindle brake with or without spindle positioning device; standard rear-mounted work-loading device with hand or magazine feeding; and high-speed drilling attachments.

Notable features of this machine are the spindle design and drive transmission. The spindle has front, rear, and center ball-bearing units. All transmission and pick-off gears are hardened and have fully ground profiles. The drive to the headstock is by means of a simple gear train which, if desired, can be disengaged to permit the spindle to be rotated freely by hand. The camshaft has an independent motor drive, permitting the use of either high or low spindle speeds in either direction during the machining cycle. The lever systems for all slides, with the exception of the turret, are adjustable for ratio and are also equipped with adjustable standard cams.

Circle Item 113 on postcard, page 239

(This section continued on page 224)

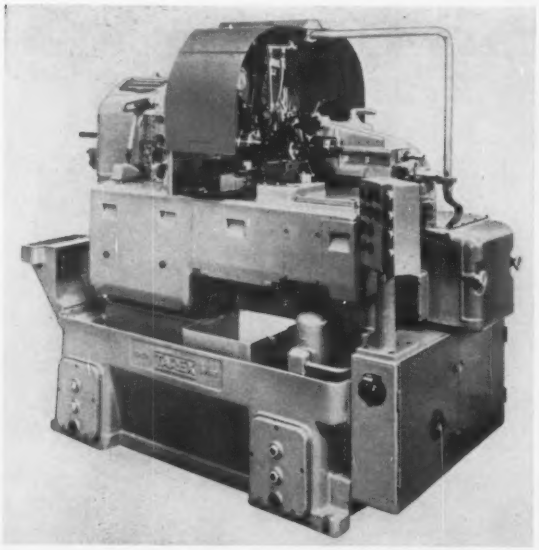


Fig. 1. Single-spindle Tarex automatic turret lathe introduced by Russell, Holbrook & Henderson, Inc.

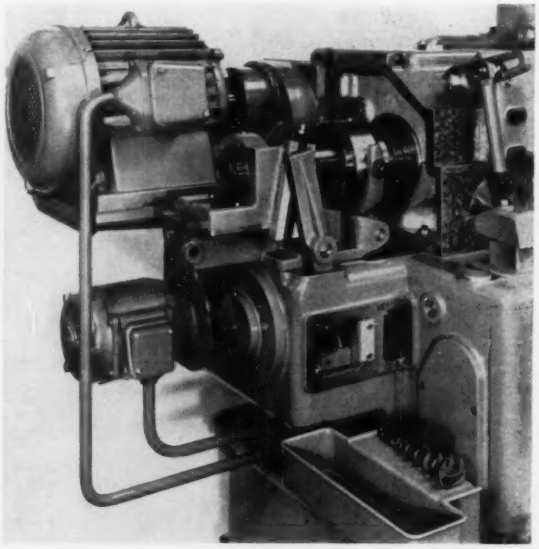


Fig. 2. Close-up of spindle-driving end of machine shown in Fig. 1 to which speed units can be added

Sets a New High in Automatic, High-Volume Production

A typical example of one Jones & Lamson approach to "automation" is this line. Here is completely automatic handling with both machine transfers and inter-machine transfers. In this line are 4 Fay automatic lathes and 1 milling and center-drilling machine. J & L machines of this type have been in use for many years in production plants throughout the world.

The simple, rugged transfers used in this line were designed, engineered and built by J & L. Control combinations are, of course, tailor-made for each individual application.

Automatic handling is also adapted to grinding operations, as shown by this J & L Model "E" Grinder (inset photo) which handles 136 steering worms per hour.

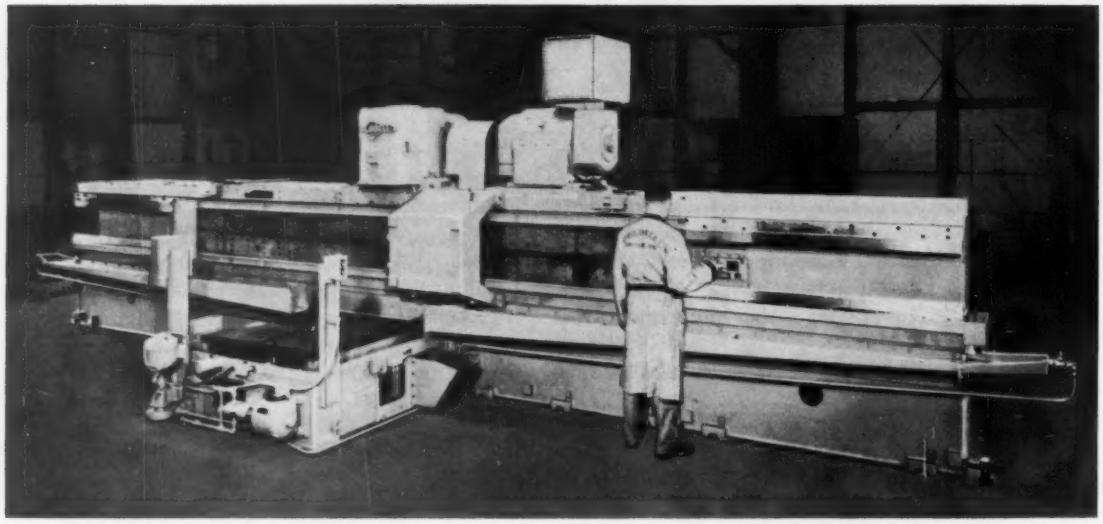
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High-speed broaching machine of new line developed by the Colonial Broach & Machine Co.

Colonial Long-Stroke Surface Broaching Machine

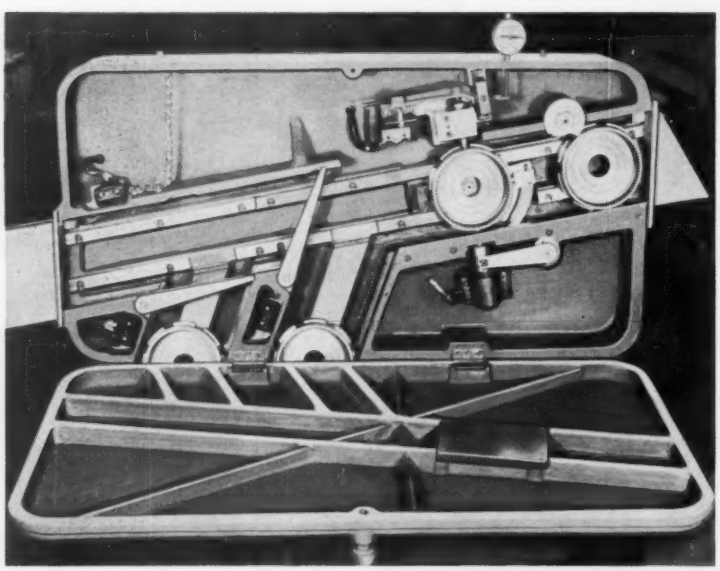
The Colonial Broach & Machine Co., Detroit, Mich., is now producing a complete line of horizontal surface broaching machines having exceptionally long strokes. Of particular interest to heavy industry are the several 240-inch stroke, gear-driven machines which come in a number of styles; 15- and 25-ton capacity; 18- or 24-inch ram face width; and with box type or vee type ways. Similar models are also offered with 180-inch strokes.

Most models in these new sizes are being equipped with phenolic-lined ways for precision broaching jobs. All models can be supplied with trunnion or horizontal shuttle tables. For two-pass broaching operations, a vertical shuttle slide is available for positioning the fixture at the end of each stroke. Broaching speeds on these machines range up to 300 feet per minute.

Circle Item 114 on postcard, page 239

Probe Type Three-Way Gear Classifier Equipped for Inspection of External Splines

An automatic, probe type monitoring system for checking the root diameters of external splines or keyways on drum type parts has been added to the three-way gear classifier line developed and built by the Michigan Tool Co., Detroit, Mich. The new unit uses a gaging-action system based on "point contact" of individual probes. These pre-set probes, will check any or all root diameters of a part on a 100 per cent basis by means of controlled indexing. Like all three-way gear classifiers, this model is designed for integration into automated production lines, particularly those lines using the Michigan Tool Co.'s "Gear-O-Mation" system.



Gear classifier equipped for inspection of external splines developed by Michigan Tool Co.

Over-, under-, and correct-size splines or keyways produced on hobbers, shapers, shavers, or "Shear-Speed" machines are gaged automatically using the root diameter as a reference base. A two-point contact system—a lower stationary probe and an upper "floating" probe—measures 100 per cent of production from a single machine or a bank of machines. Both a visual and electri-

The ONLY Turret Lathe with a fully automatic thread-chasing cycle!

Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader! Nowhere else in the world can this be found on a turret lathe.

This Auto-Threader will chase straight or taper threads — or a combination — internal or external, from the front of the machine.

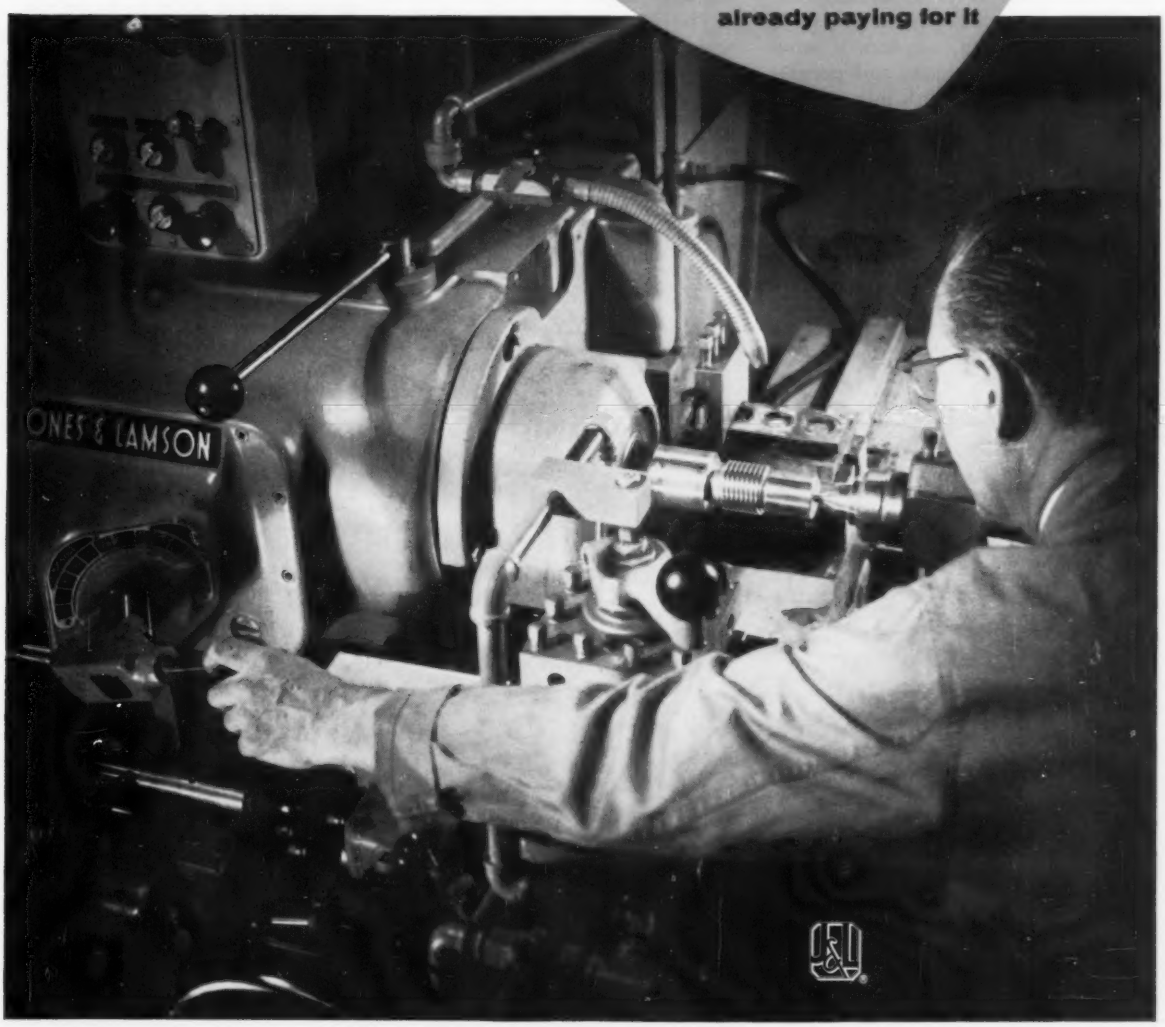
Concerning this J&L development, a customer writes: "We are tripling production on many of our items."

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cal check of production accuracy are provided within the specified tolerances of the spline root diameter.

In operation, parts enter the classifier from the right side and move down an inclined ramp to a stop position. They are then indexed as necessary and measured in the probe-sizing operation. Parts with root diameters within specified tolerances continue through the classifier to the next operation. Any over- or undersize parts are automatically shunted aside and collected separately for salvage or scrap.

Circle Item 115 on postcard, page 239

Turret Type Drilling Machine

A Model A-50 turret type drilling machine designed specifically to meet the needs of the jet aircraft engine industry for performing consecutive drilling, reaming, counterboring, and tapping operations in large, circular patterns has been brought out by Howe & Fant, Inc., East Norwalk, Conn.

The large, circular table of the machine accommodates rotary fixtures up to 48 inches in diameter. It is equipped with a complete coolant system, requires a minimum of floor space, and permits the operator to work in a conventional position. The turret of the machine carries six spindles which work on a common axis and are indexed into position as required. Speed, depth, and reversals for tapping are pre-set for each spindle and repeat automatically as the turret is indexed.

The work-piece is loaded in a rotary fixture and indexed from one hole location to another, all necessary operations being performed at each hole location by indexing the turret. This procedure is said to minimize handling time and produce work of the highest quality.

The quill of this machine, which carries the turret, is counterbalanced for extreme sensitivity and provides 6 inches of travel. The head of the machine is separately counterbalanced and adjustable through a travel of 15 inches.

Circle Item 116 on postcard, page 239

Precision Adjustable Pitch Lead-Screw Tapper

A precision adjustable pitch lead-screw tapper has been announced by the Jarvis Corporation, Middletown, Conn. This tapper is so designed that one lead-screw will cut all listed pitches, eliminating down time for changing lead-screws. The tapper is available in two models. Model AP 9100 allows conversion from 11 pitch to 12, 13, 14, 16, 18, 20, 24, and 28 pitch in a matter of seconds. Model AP 9000 converts from 24 pitch threads to 28, 32, 36, 40, 44, 48, 56, 64, 72, and 80 pitch.

A precision graduated scale, indicating pitch settings, is attached to a lever which controls the vertical travel of the lead screw follower and the tap. Adjustments of the graduated scale by loosening, adjusting, and then tightening four socket screws, give speedy conversion from one pitch to another. The adjustable pitch lead-screw tapper is recommended for long, precise production tapping runs as well as for short job work.

Circle Item 117 on postcard, page 239

(This section continued on page 228)



Howe & Fant turret type drilling machine



Jarvis adjustable pitch lead-screw tapper

Speedy, Accurate Inspection at a Glance!

Jones & Lamson Optical Comparators are unexcelled for toolroom, laboratory and production-line inspection and measurement work. They precisely measure height, depth, lead or spacing, as well as angles to degrees and minutes. By comparing intricately contoured parts with a master outline, they measure the amount of error. J & L Comparators are versatile and flexible — perform a variety of inspecting and measuring functions. Moreover, they are convenient to operate, easy to set up, and read direct without computation.

In regard to this typical application, shown below, Modern Corporation, Detroit, says "Modern Corporation's 30-inch J & L Comparator has become the key instrument in the inspection of fine MODCO tools . . . protects quality prestige . . . customers' rejections kept very low . . . saves $3 to $5 per hour when used on large tools."

Send for our latest Comparator Catalog. JONES & LAMSON MACHINE COMPANY, 512 Clinton Street, Springfield, Vermont.

JONES & LAMSON COMPARATORS

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Optical Comparators • Thread Tools Thread & Form Grinders

the man who needs a new machine tool is already paying for it



For more information fill in page number on Inquiry Card, on page 239

Deburring and Chamfering Machine for Hypoid Pinions

A single-station "Burr-Master" machine for deburring and chamfering medium to large hypoid pinions having short or long shafts is announced by the Modern Industrial Engineering Co., Detroit, Mich. This machine, known as Model BMHP-15, handles pinions having from 8 to 15 teeth in an outside diameter range of 3 1/4 to 8 inches and shaft lengths up to 15 inches, at production rates up to 280 pinions per hour. The push-button controlled, completely automatic machining cycle permits one operator to handle two machines.

The machine deburrs and chamfers an acute-angle profile and part of the root at the toe and heel ends of each tooth and, when required, produces a peripheral chamfer on the large end, removing sharp edges. All sharp corners at the root of the tooth are eliminated through the patented cutting action which generates the chamfer uniformly. The part is ejected by pressing a foot pedal, a safety interlock preventing accidental ejection while the machine is running.

An outstanding feature of this machine is its quick, easy change-over from one size pinion to another. Under certain conditions it can be tooled for four different diameter pinions in a ten-minute change-over. Specially developed, high-speed steel form tools of the dovetail type are used. Reground tools are reset without gaging merely by bringing them against a stop. A built-in chip-disposal chute is provided, and automatic chip disposal is available.

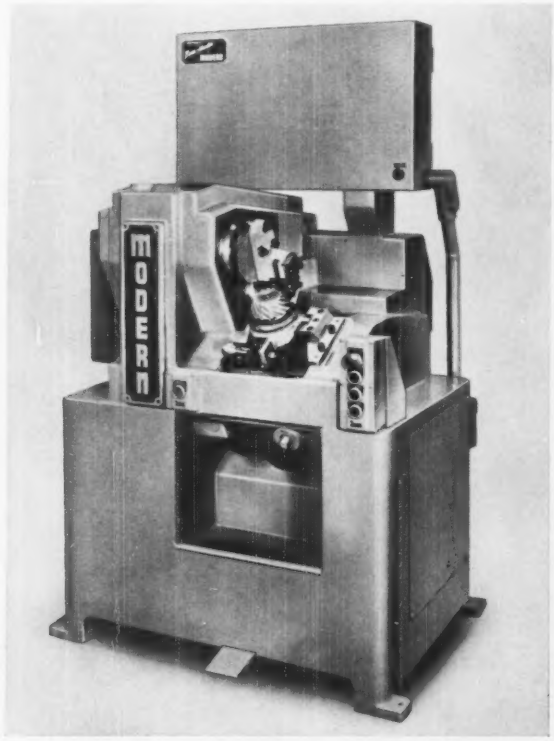
Circle Item 118 on postcard, page 239

Geared-Head Horizontal Milling Machine

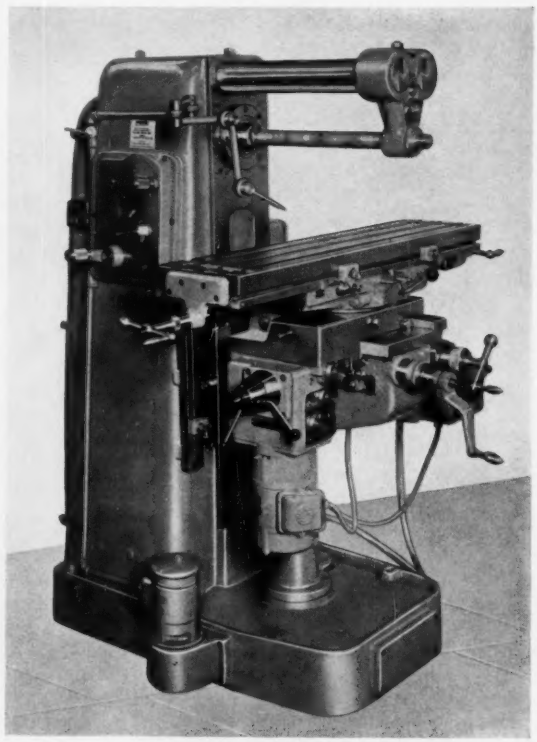
A geared-head horizontal milling machine, known as Hero Model 1C, is available in both plain and universal types from the Morey Machinery Co., Inc., New York City. This rigidly constructed machine is designed to transmit maximum power to the spindle and to give the highest degree of accuracy. It has twelve spindle speeds ranging from 35.5 to 1400 R.P.M.

The spindle is mounted in anti-friction bearings, taper roller bearings being used in the rear position. The knee gives ample support to the table, and the double over-arm provides maximum rigidity. All slide ways are scraped and provided with adjustable gibs.

The table of the universal model can be swiveled 45 degrees, left or right. Extra attachments adapt the machine for a wide range of milling applications. The gear-box for changing spindle speeds has hardened gears made of alloy steel. Spline shafts are also hardened and ground. The pinion and bull gears on the spindle have helical ground teeth to insure freedom from vibration and noise. Six high



Deburring and chamfering machine for pinions announced by Modern Industrial Engineering Co.



Horizontal milling machine introduced in this country by the Morey Machinery Co.

Gives Versatility . . .
Fast Change-over . . . Micro-Size Control

Typical of J&L thread tool products is the MC Collapsible Tap (illustrated here) for use on either stationary or rotating jobs. This one complete tap, plus parts, gives five sizes of taps ranging from 1 5/16″ to 3½″.

Jones & Lamson's recent purchase of the Modern Tool Works, Rochester, N. Y. greatly broadens J&L's service in the thread tool field. Now, from the operators of the world's most modern thread tool plant, you can get complete lines: die heads and chasers; accessories and sharpening equipment; plus a line of collapsible taps and chasers, solid adjustable taps and chasers, the Modern-Magic Chuck, and the Modern Stud Setter. Complete engineering service is available for the entire line of products.

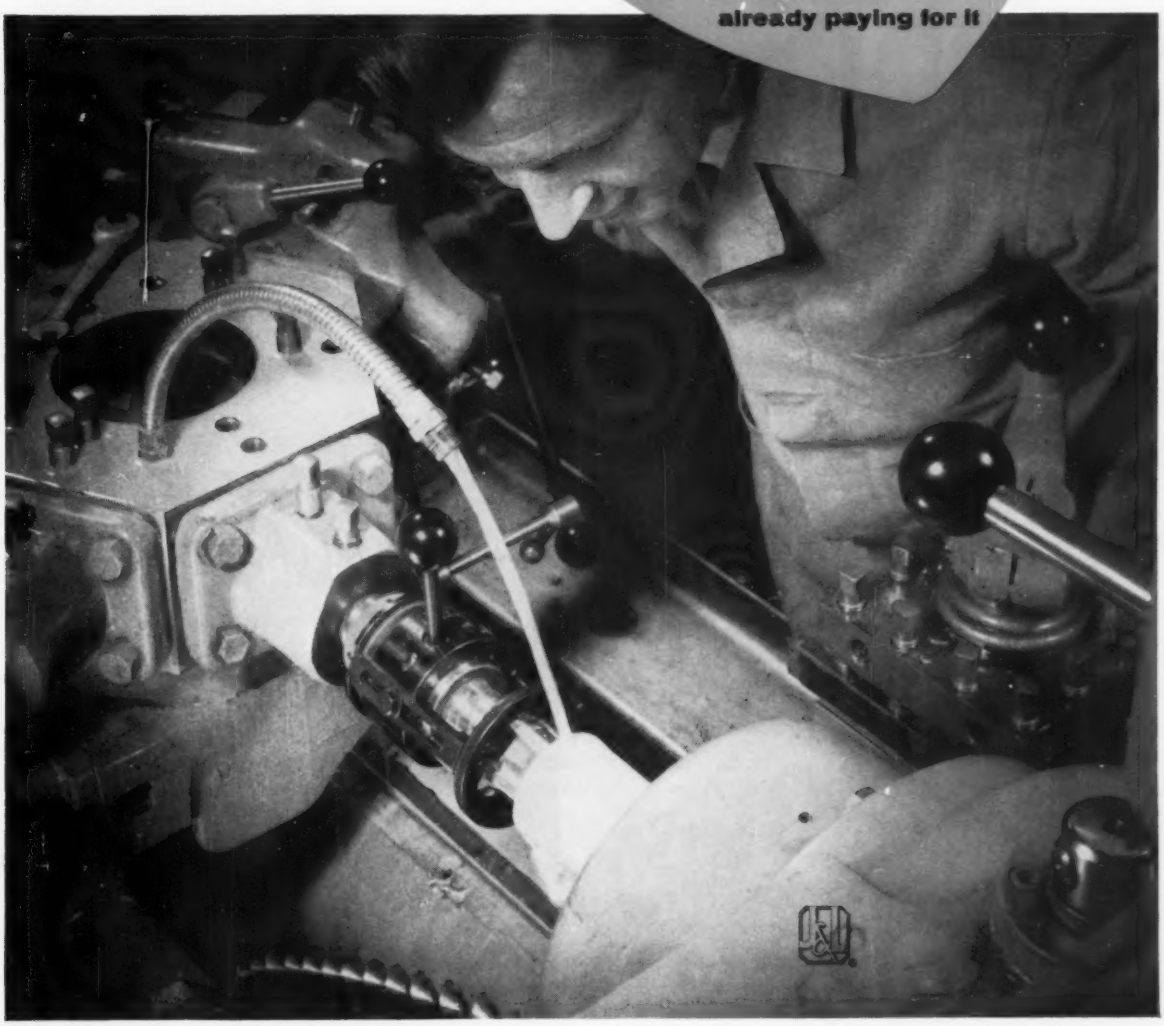
Send for Thread Tool Catalog. JONES & LAMSON MACHINE COMPANY, 512 Clinton Street, Springfield, Vermont.

JONES & LAMSON

THREAD TOOLS

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Optical Comparators • Thread Tools Thread & Form Grinders

the man who needs a new machine tool is already paying for it



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speeds are obtained through a special belt that eliminates chatter and six low speeds are available directly through a gear train.

Speeds and feeds are read directly from large graduated dials. Push-buttons for starting, stopping and inching are within easy range of the operator. There is an extra inching push-button beside the shifting handle on the gearbox. The feed motor is started by a directional control lever.

Circle Item 119 on postcard, page 239

General Electric Accessory for Semi-Automatic Spot-Welding Equipment

A semi-automatic spot- and tack-welding accessory for use with all models of its semi-automatic "Fillerarc" wire drive unit, has been announced by the General Electric Co.'s Welding Department, Schenectady, N. Y. The accessory is available in kit form or as a factory installed unit on current models. It consists of a gun adaptor kit and control, the gun kit including locating plates for butt-corner and fillet welds. Adaptations can also be made for welds of other types.

The controls are mounted permanently on a steel door that replaces the standard door on the wire drive unit. Protective plates furnished with the kit make it unnecessary to use a helmet.

Control for the unit consists of a timer, which can be set for welding times of from 8 to 360 cycles; an on-off switch for the timer; and a slow-fast switch for the speed with which the wire drive is started. With the slow start setting, the striking of the arc immediately brings the wire drive to normal speed. In the control circuit are the pneumatic time delay relay, the on-off and slow-fast start switches, and a current pick-up relay. With this equipment, the operator places the gun in position and pulls the trigger, which starts the electrode wire feed and gas. As soon as the wire touches the work, the arc is struck, tripping the timer, which stops the weld as determined by the pre-set time delay.

Circle Item 120 on postcard, page 239

Concentricity Attachment for Bryant Bench Gage

A concentricity attachment to be used in conjunction with the Bryant B-21 bench gage is now being manufactured by the Bryant Gage & Spindle Division, Springfield, Vt. The attachment is used to check concentricity of small internal conical surfaces in relation to a thread on aircraft parts and similar work-pieces. In the illustration, the gage is shown with the work removed. With this gage, an internal conical surface (approximately 3/4 inch in diameter and 1/16 inch wide) is checked for position in relation to a 15/16-12 internal thread.

Checking is done by a pivoted pin follower which contacts the conical surface and transmits any eccentricities of the surface to a dial indicator. A ball slide follower is incorporated in the concentricity attachment to compensate for thread progression and to allow checking the conical surface through one or more full turns of the work part. The size of the internal thread is checked at the same time.

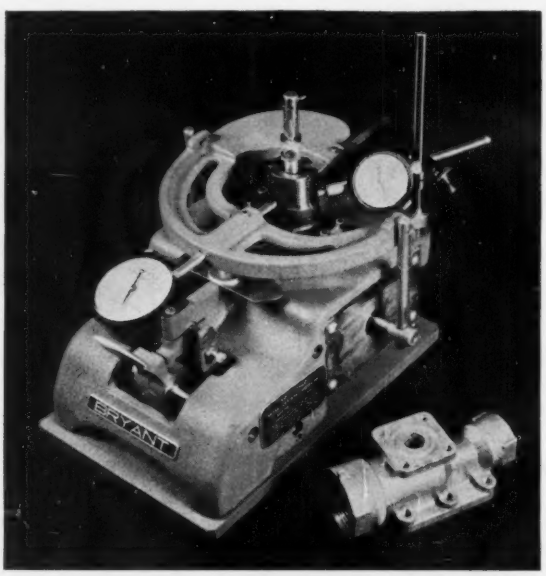
Circle Item 121 on postcard, page 239

General-Purpose and Iron-Powder Electrodes

A general-purpose Airco 90B electrode which meets the AWS and ASTM E-6013 classification is available from Air Reduction Sales Co., Inc., Division of Air Reduction Co., Inc., New York City. This heavily coated electrode of moderate arc force is designed to operate in all positions on alternating or

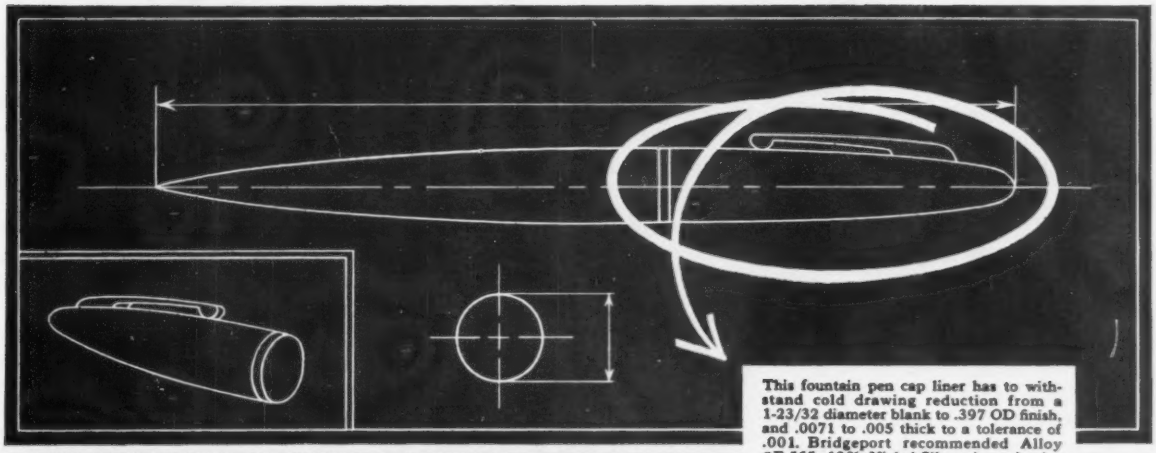


Welding accessory announced by General Electric Co.

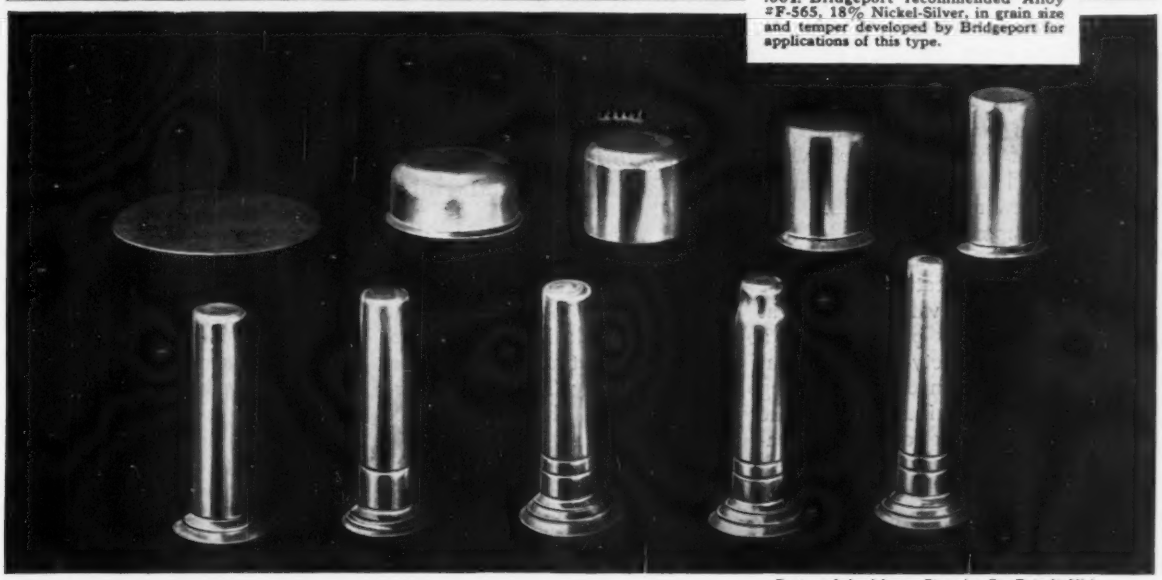


Bryant bench gage with concentricity attachment

Matching metal to job with Bridgeport alloys



This fountain pen cap liner has to withstand cold drawing reduction from a 1-23/32 diameter blank to .397 OD finish, and .0071 to .005 thick to a tolerance of .001. Bridgeport recommended Alloy *F-565, 18% Nickel-Silver, in grain size and temper developed by Bridgeport for applications of this type.



Parts made by Advance Stamping Co., Detroit, Mich.

For better stamping, drawing, cold forming... Bridgeport **HIGH I. Q.*** Strip and Sheet

Let Bridgeport match the metal to the job! Tell us your requirements—both working and service properties—and our Technical Service will be glad to recommend the right Bridgeport High I.Q. alloy for the job. The right alloy may help you cut production costs and produce a better product. Call your Bridgeport sales office today for a metal recommendation to fit your specific needs.

**High Inner Quality*

BRIDGEPORT BRASS

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut • In Canada: Noranda Copper and Brass Limited, Montreal

For more information fill in page number on Inquiry Card, on page 239

direct current and is particularly useful in welding mild steel to medium-carbon and low-alloy steels. In addition to high mechanical and impact properties, the finished bead is said to be free of surface depressions.

An iron-powder electrode, known as Airco Easyarc 10, has also been developed to meet the requirements of the AWS-E-6010 classification. This electrode provides a shallow rippled, smooth weld deposit in all welding positions. It can be used for welding tanks having plain or galvanized surfaces and for field construction, shipyard, or other work where out-of-position welding is encountered.

Circle Item 122 on postcard, page 239

Dual-Spindle Lathe

The Boye & Emmes Machine Tool Co., Cincinnati, Ohio, is offering a dual-spindle lathe designed to provide facilities for turing both large- and small-diameter work. This lathe consists virtually of two machines in one. The upper spindle provides a swing-over-the-bed of 60 inches, and the lower spindle, a swing of 40 inches. The two spindles are located in the most convenient positions for the operator, the point of contact betwen work and tool always being within plain view and easy reach.

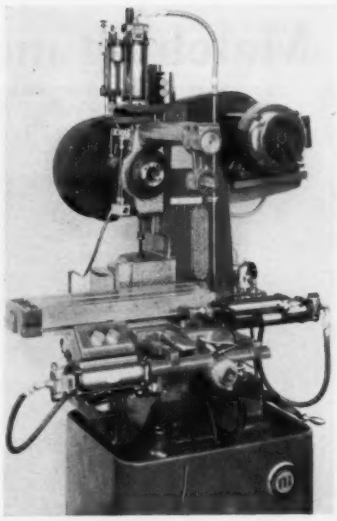
An important feature of the machine is an arrangement which enables the operator to engage or disengage the various drives at will under the protection of a mechanical safety-interlock that prevents any machine-damaging movements. An illustration of the practical application of this feature is the ability to hold work stationary between the upper spindles while an attachment, mounted on the carriage, performs milling or grinding operations throughout the entire length of carriage travel.

The lathe is built to support work weighing up to 15 tons between centers, in any required bed length, and in one piece up to 35 feet between centers. All standard lathe attachments are available for this machine.

Circle Item 123 on postcard, page 239

Nichols High-Speed Automatic Milling Machine

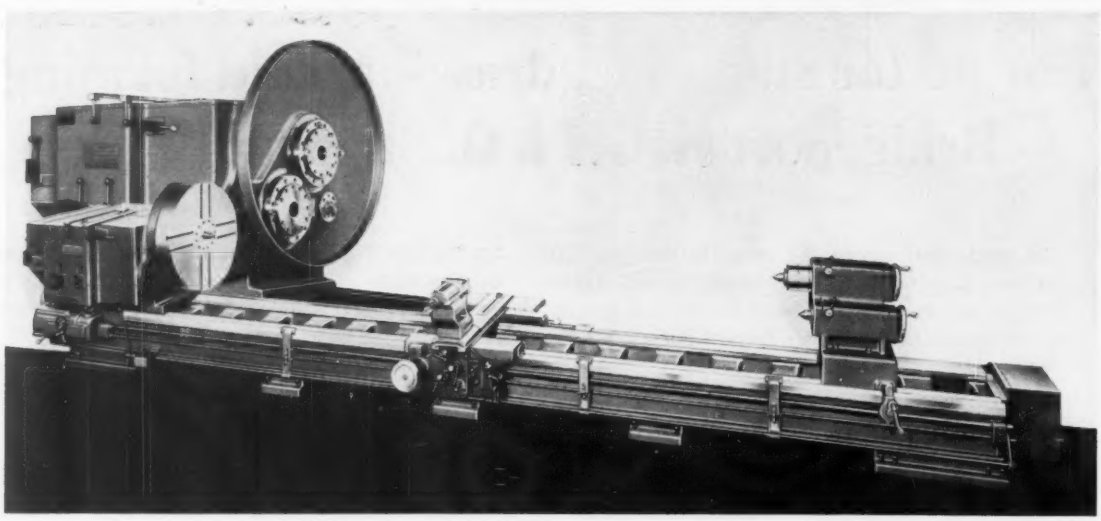
The W. H. Nichols Co., Waltham, Mass., has announced the development of high-speed automatic milling machines suitable for slicing and dicing germanium ingots for the transistor manufacturing industry. These millers are of the rise-and-fall spindle type with speeds ranging up to 10,000 R.P.M. and will be placed on the market by the Robert E. Morris Co., West Hartford, Conn.



Nichols milling machine placed on market by the Robert E. Morris Co.

Automatic mist-lubrication is provided for spindle bearings and anti-friction over-arm type arbor support. Diamond-impregnated sawing discs up to 8 inches in diameter can be accommodated. The automatic transverse feed of 6 inches is adjustable in increments of from 0.001 to 0.085 inch and is synchronized with automatic pneumatic feeds of spindle head and table for high-speed, continuous slicing cycles. All feeds are air-actuated. Motors and all rotating members are precision-balanced.

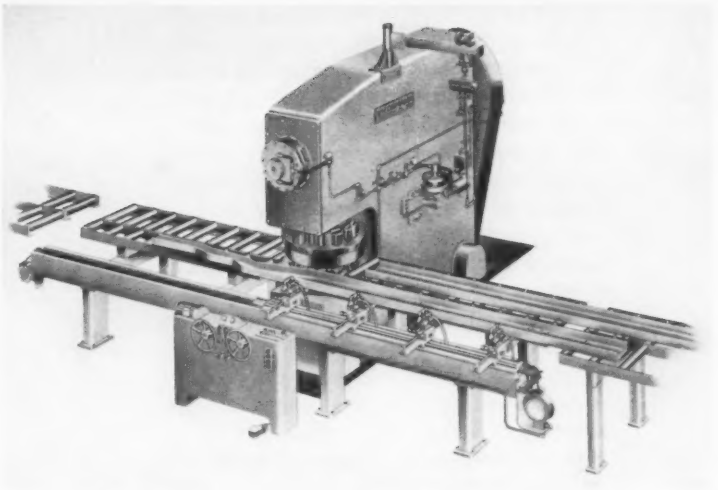
Circle Item 124 on postcard, page 239



Dual-spindle lathe brought out by the Boye & Emmes Machine Tool Co.

Wiedemann Turret Punch Press

A turret punch press for punching frame side rails, fish plates, wrap-arounds, and other frame members used in the manufacture of custom trucks and various other products has been announced by the Wiedemann Machine Co., Philadelphia, Pa. This Type R-152 Wiedemann press has a capacity of 150 tons and will punch holes in channeled frame members up to 3/8 inch thick. Work is mechanically located and punched without a layout. This operation is said to take only a fraction of the time required by the conventional layout and drilling method.



Turret punch press announced by Wiedemann Machine Co.

Both left- and right-hand members can be handled with equal ease regardless of length. The operator uses a handwheel for each motion to quickly and accurately position the work for punching. Work positioning information is read from a simple work chart. This shows the required tool or turret station number and the dimension from the two edges of the work for each hole. Dimensions corresponding to the position of the work are clearly read from two dials set in the operator's control station.

Twenty punches and dies up to 3 inches in diameter or 3 inches square are carried in the turrets ready for use. Any tool is brought into the punching position in one and one-half to five seconds by the automatic station selector on the operator's console.

Circle Item 125 on postcard, page 239

Thomson Linear Ball Bearings

A new type ball bearing for linear motion has been developed by the Thomson Industries, Inc., Manhassett, N. Y. These bearings, known as "Adjustable Diameter Ball Bushings," are spilt longitudinally as illustrated in Fig. 1. They are designed to provide line-to-line or slight preload fits when mounted in an adjustable-diameter housing, giving free-running no-play linear motion.

The tolerance on both the shaft diameter and bearing bore can be easily adjusted. This adjustment provides means for compensating for wear that might eventually develop in severe applications. The bearings are frequently used in a housing that is merely split and provided with an adjusting screw. Drawings are available showing numerous arrangements

(Continued on page 236)

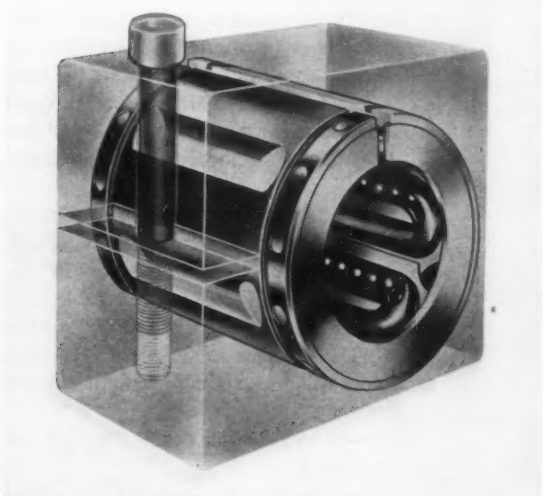


Fig. 1. Thomson "Adjustable Diameter Ball Bushings"

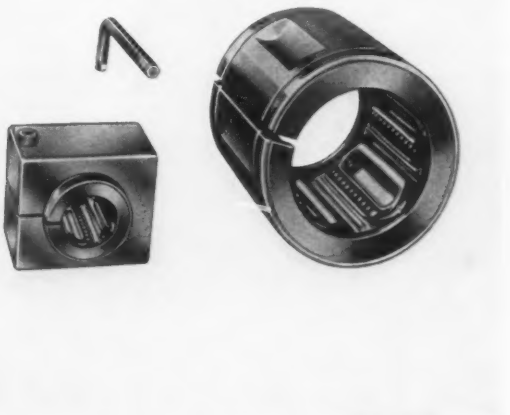


Fig. 2. Thomson "Open Type Ball Bushings"

A "useful life" is not

for production men

This Avey machine drills various patterns of holes in jet engine parts by changing program drums or by alternating two automatically-driven shot bolts which locate the table accurately from a radial position. Program drum also programs one or more of the four drilling units for drilling, reaming, and similar operations.

The machine consists entirely of standard Avey units: four Aveydraulic automatic units with 12″ feed; cast iron columns; 120″ fan type steel base; 60″ Electrodex table. Top column and unit have an in-and-out traverse of 20″. The ways are mounted on steel adaptor blocks which can be removed for different heights.

All units and the index table are push button-controlled.

If you're looking for flexibility in a special machine, your Avey man's the man to see.

for management

Many machine tool buyers were caught between the tax authorities' "useful life" of 20-25 years and their machines' profitable life of 6-7 years. If you were caught in this dilemma, you recovered only a fraction of a machine's cost through depreciation by the time it should have been replaced; so you couldn't build up any replacement reserve.

Now you have a collection of antiques which lose nearly as much money in production as they do when they're down. Furthermore, they lack the productive capacity to keep pace with your currently expanding markets.

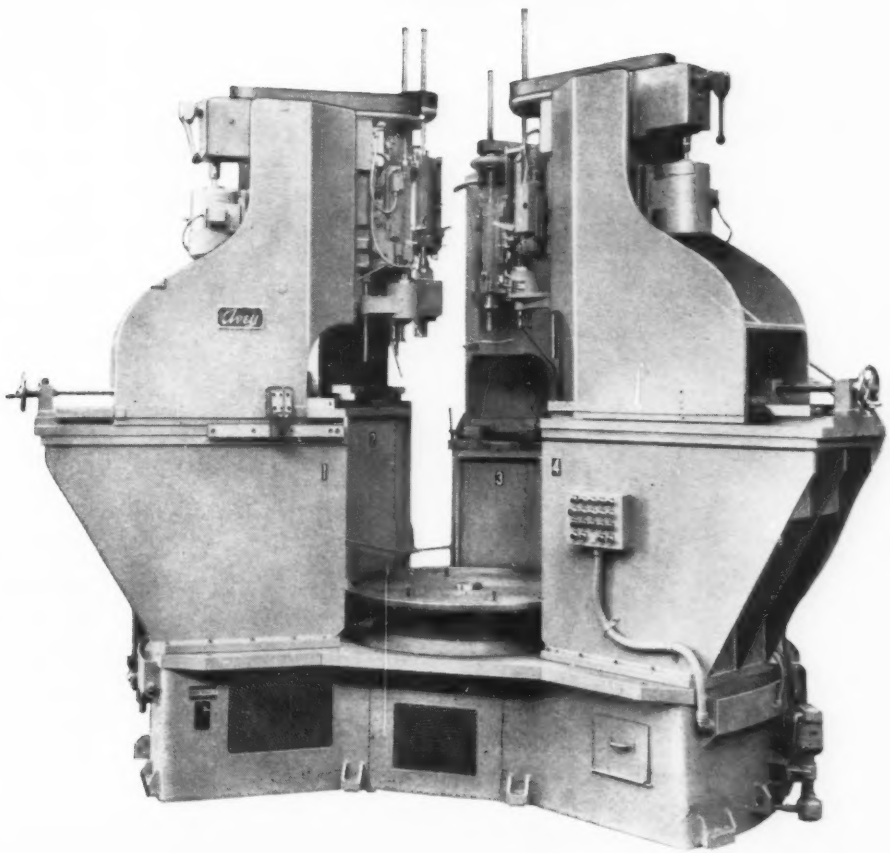
Avey has a combination to get you out of this dilemma: first, a pay-as-you-produce plan which solves your ready cash problem; but more important, production machines with such a fast rate of return on your investment that you'll be making clear profit in two years or less.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

a happy one

Avey



used in the design of machine tools, special machinery, small precision mechanisms, and many other devices where free linear motion without play is desired. These bearings are available in standard sizes for shaft diameters ranging from 1 inch to 4 inches.

In Fig. 2 is shown another type of linear ball bearing developed to permit the use of shaft support members along the length of the shaft traversed by the bearings. These bearings are known as "Open Type Ball Bushings" and are recommended where extreme rigidity or unusually long shafts are a requirement. They are also made to standard dimensions for shaft diameters ranging from 1 inch to 4 inches.

Circle Item 126 on postcard, page 239

Clausing Heavy-Duty Hydraulic Tracer Lathe

A 12-inch heavy-duty duplicating lathe equipped with hydraulic tracer has been announced by the Clausing Division, Atlas Press Co., Kalamazoo, Mich. This lathe is designed for rapid, automatic, reproduction of multiple diameters, tapers, bevels, shoulders, radii, grooves, and chamfers. Parts produced on this lathe are said to have the same accuracy as the template.

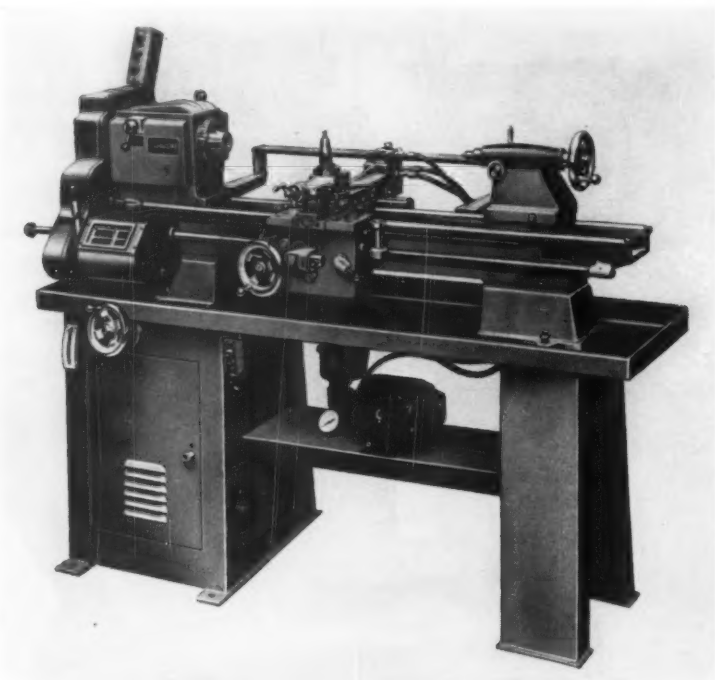
Power to firmly feed and hold the cutting tool is provided by a hydraulic cylinder housed in the servo motor mounted on the lathe cross-slide. Motor, pump, reservoir, and pressure gage are an integral unit and are located on a shelf under the chip pan of the lathe. The template mounting bar is designed for templates made of flat stock from 1/8 to 1/4 inch thick.

Lathe bedways are flame-hardened and precision-ground. The variable-speed drive makes instantly available any spindle speed—from 43 to 222 and from 250 to 1300 R.P.M.—without stopping the lathe or shifting belts. A 1 1/2 H.P.-motor is furnished with the lathe.

Headstock, apron, and quick-change gear-box are completely enclosed, the gears running in a bath of oil. The spindle is of forged steel, precision ground, and turns on Timken "Zero Precision" tapered roller bearings. It has a 1 3/8-inch bore and a collet capacity of 1 inch. The spindle nose is the ASA L-00 tapered key-locked type. The heavy-duty tailstock has a No. 3 MT ram with tank socket and will handle big tools without slippage.

The tracer handles work up to 2 1/2 inches diameter differential and 18 inches in length. Slide feed, in and out, is infinitely variable from 0 to 15 inches per minute. Swing capacity is 12 3/4 inches over the bed, 12 3/8 inches over saddle wings, and 7 5/8 inches over the cross-slide. Capacity between centers is 33 1/2 inches. Fifty-four standard threads ranging from 4 to 224 threads per inch, either right- or left-hand can be cut.

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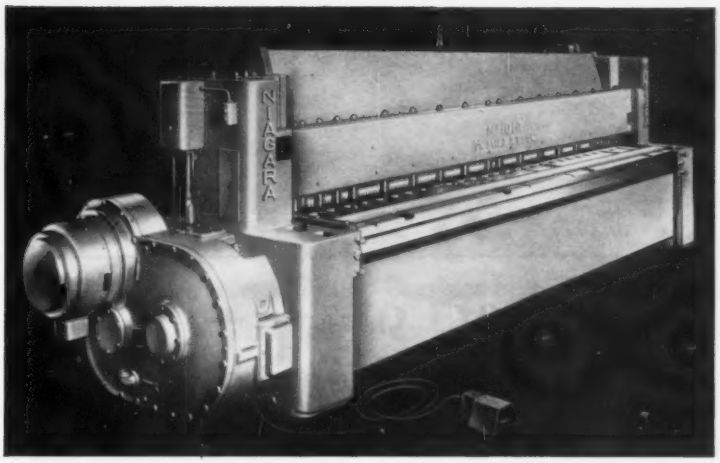
Clausing heavy-duty tracer lathe announced by the Clausing Division, Atlas Press Co.

Niagara Modernized Power Squaring Shears

The line of underdrive squaring shears built by the Niagara Machine & Tool Works, Buffalo, N. Y., has been modernized with many time- and labor-saving features, and optional accessories. A hinged back-gage angle which enables long plates to be fed through the shear can be swung up and out of the way when not in use. An adjustable, parallel micrometer back-gage, now standard on all models, permits fast, precise settings for cutting blanks or strips without the use of rules or wrenches. A light-beam shearing gage consisting of a lighting fixture installed in the correct focus to cast a sharp, dark, shadow line facilitates shearing angular and irregular shapes to scribed lines.

Disappearing adjustable stops mounted in the dovetail slots of the bed or front brackets permit feeding sheets without lifting them and without the risk of marring their surfaces. A remote-control electric foot-switch facilitates operation of the shear at the end of a long sheet, or when trimming wide sheets which extend the full length of the bed. A stationary safety guard attached to the frame serves to protect the operator at all times.

The complete line of Niagara



Modernized power squaring shear made by Niagara Machine & Tool Works

underdrive shears includes fifty-nine models with capacities ranging from 16-gage to 1-inch mild steel, and cutting lengths from 4 to 20 feet.

Circle Item 128 on postcard, page 239

Snyder Palletized Transfer Machine for Processing Steel Forgings

A twenty-six-station, segmented palletized transfer machine for rapid processing of forged-steel steering knuckles has been designed and built by the Snyder Tool & Engineering Co., Detroit, Mich. This 60-foot long machine mills, hollow mills, drills, spotfaces, taps, and reams 146 steering knuckles per hour.

Two parts are clamped in pallet type fixtures that are moved from station to station in the machining section by a transfer mechanism. The pallets are returned to the position for the first machining operation by a motorized conveyor which passes through a wash and blow-off section. A unique automatic fixture-clamping arrangement speeds part clamping and unclamping operations and assures clamping of the forgings in a position that will provide uniform stock removal.

The machine is specially designed to handle steel parts. At the machining stations where hollow-milling operations are performed, coolant is directed to the machined surfaces through the milling cutter spindles, as well as through external piping. All operations on the segmented, in-line transfer machine are performed with units that have individual bases and individual control panels to simplify maintenance problems and provide maximum flexibility for part design changes. Two parts are loaded in each fixture at Station 1 on the hydraulically operated, electrically controlled machine.

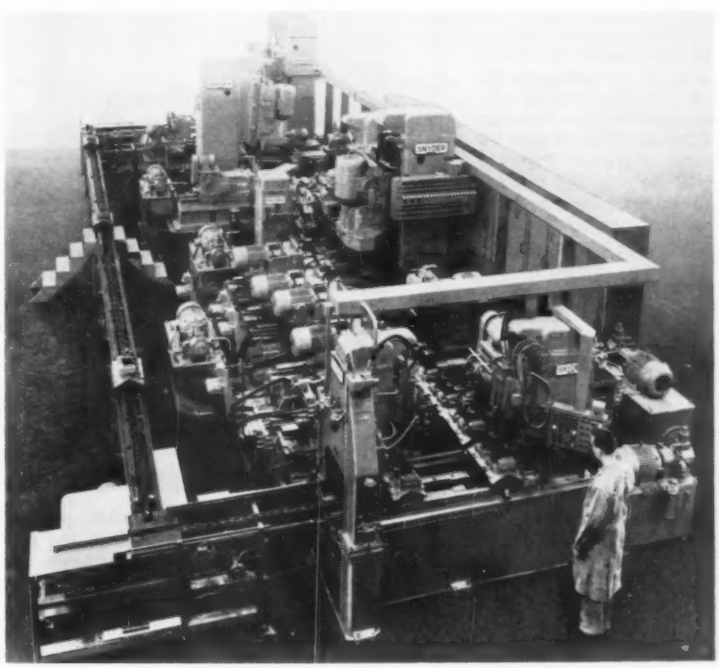
Circle Item 129 on postcard, page 239

Lincoln Jetweld Low-Hydrogen Iron-Powder Electrode

The Lincoln Electric Co., Cleveland, Ohio, has announced a new all-position, low-hydrogen, iron-powder type electrode called Jetweld LH-70. This electrode is intended for general-purpose welding of all steels with high currents and for welding crack-sensitive steels and steels that tend to produce porosity in the weld metal. It has the usual low-hydrogen electrode advantages plus those of iron-powder electrodes: high deposition rate, easy slag removal, and excellent operating characteristics. Typical uses are for welding low-alloy steels which must be welded without preheat, high sulphur-free machining steels, steels to be enameled, medium- to high-carbon steels, and thick sections. This electrode is available in 1/8, 5/32, 3/16, 7/32, and 1/4 inch sizes.

Circle Item 130 on postcard, page 239

(This section continued on page 244)



Snyder segmented palletized transfer machine for processing steering knuckles

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

Tighten bolts to yield strength?

Actually, it is safer to "overtighten" than to undertighten. The following explains why.

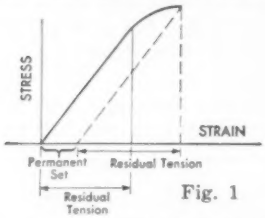


Fig. 1

Up to yield point, the strain in a bolt is proportional to stress. *Beyond* the elastic limit, the bolt goes into its "plastic range". Some permanent stretch takes place. (Fig. 1). Yet while the bolt will not return to original length, note that *residual tension* is fully maintained. And remember, it's *this* force that keeps a bolt tight, determines joint strength.

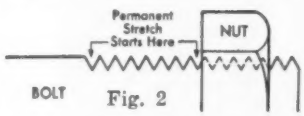
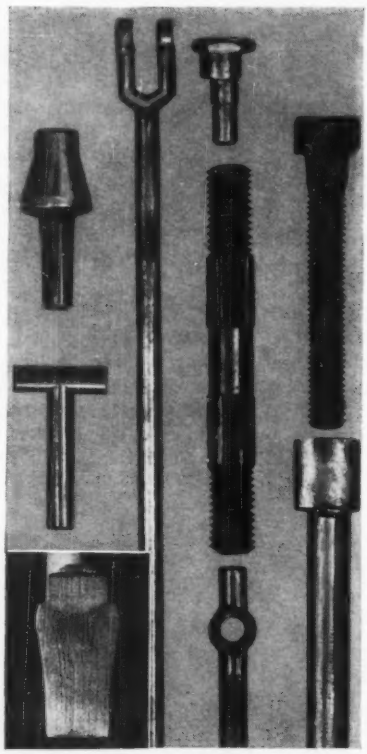


Fig. 2

The permanent set starts at section with highest unit stress —which is at the unengaged threads (Fig. 2). Ultimately, this throws thread pitch off and nut locks, subjecting bolt to torsion (rather than further tightening). This force disappears with wrench-removal. Thus, a bolt can even be torqued well into its plastic range if it won't be reused or need adjustment.

Cold facts on cold headed fasteners



RB&W cold heading machines have forced metal to flow into this typical variety of shaped pieces—just a handful of thousands of different cold headed shapes produced by RB&W to specification. The upset can be at any point, and the shape need not be symmetrical. The continuous, symmetrical flow lines (inset) make metal stronger.

NO ATTEMPT to simplify, improve or economize on fastening is complete without a good look at your screw machine parts, forgings, and certain assemblies that can be reduced to one piece.

You would be surprised at what an expert can produce on cold headers with complete uniformity. Cold heading produces in one piece parts that would otherwise be two or more.

BETTER FLOW LINES

Just as it does with standard fasteners, cold heading makes possible a higher quality, stronger product at high speed and low cost. Properly done, the operation upsets metal along its own axis in continuous flow lines without folds. Stress patterns are better. Fasteners and parts gain greater shear, impact and fatigue strength.

Long a specialist in cold headed fasteners, RB&W offers its experience to designers and production men who want to know whether cold heading is feasible for specific mechanical shapes. If it proves to be so, RB&W facilities can handle your volume needs. Contact Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Spin-Lock® Screws solve assembly problem

The designer specified countersunk-head screws to be used in a particular casting. The production man had to stake these in to anchor them. But this meant extra operation, made screw removal damaging and difficult.

The answer was found in Spin-Lock screws. These have hardened "ratchet-action" teeth that bite in when tightened, take 20% more torque to loosen than to tighten, can be reused. Send for Bulletin.



Spin-Lock "tooth" about to bite in. Head meets seat when fully tightened.

For more information fill in page number on Inquiry Card, on page 239

PRODUCT INFORMATION SERVICE

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On New Shop Equipment described in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

STEEL CASTINGS SPECIFICATIONS—Steel Founders' Society of America, Cleveland, Ohio. Summary including all of the specifications recommended for commercial, railroad, federal, and military use, together with reference to testing methods advocated by the committee. Copies are available free upon request to the Steel Founders' Society of America, 606 Terminal Tower, Cleveland 13, Ohio.

UNDERDRIVE SQUARING SHEARS—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 69G, giving complete information on the company's entire line of underdrive power squaring shears. 74 pages describe and illustrate fully such features as multi-jaw sleeve clutch; rigid, box type construction; self-compensating hold-down; fully enclosed drive; low outline for complete visibility; four cutting edge knives; and self-measuring back-gage. Numerous photos of job applications show the shears at work for leading mass producers, fabricating plants, steel warehouses, and sheet-metal shops. Well-defined specifications for each of the fifty-nine models in the company's underdrive line of power squaring shears are brought together in a single large table for easy reference. Shearing capacities range from 16-gage to 1-inch mild steel and cutting lengths from 4 to 20 feet. 1

COMBUSTION SAFEGUARDS — Selas Corporation of America, Dresher, Pa. Bulletin SC-1006, describing the operation and construction of the company's automatic Fire Checks which detect, localize, and extinguish flashback in mixture supply lines where a combustible mixture of fuel, gas, and air is distributed to heating equipment. Described are also the company's Safety Blowouts which prevent flashback pressure in combustible mixture main supply piping. 2

THREAD-ROLLING ATTACHMENTS — Landis Machine Co., Waynesboro, Pa. Catalogue G-96-2, describing the company's Lanroll thread-rolling attachments for the precision rolling of taper pipe threads. Five sizes are available for the various sizes and makes of automatic screw machines. Although designed primarily for screw machine application, they can also be applied to the cross-slide of a lathe providing power feed is available. 3

THREAD GAGING — Standard Pressed Steel Co., Jenkintown, Pa. Booklet designed to aid in the correct gaging to check pitch diameters—a critical dimension in thread fit. Booklet points out that two intrinsically different types of thread gages—a functional type for checking the high limit of tolerance and a power pitch diameter type for checking the low limit of tolerance—must be used to provide a true indication of thread fit. . . 4

PARTS WASHERS—Gear-O-Mation Division, Michigan Drill Co., Detroit, Mich. Bulletin describing the company's production line parts washers. These compact washers are of the needle-spray type with multiple air jets for solvent removal and parts drying. Using a chain drive for parts movement, the washers will handle up to 1000 parts per hour. 5

MINIATURE GASKET THERMOCOUPLES—Thermo Electric Co., Inc., Saddle Brook, N. J. Bulletin describing the company's line of miniature gasket thermocouples. General information is given on available calibrations, temperature ranges and gasket sizes, and a separate section on terminals and quick-coupling connectors for aircraft and miniature thermocouples. 6

TUBE MILLS — Yoder Co., Cleveland, Ohio. 64-page illustrated handbook entitled "Electric Resistance Weld Tube Mills," describing in detail the use of modern tube mills in the manufacture of pipe and tube. A step-by-step description of the electric-weld process beginning with roll-forming and shaping of tube through to the finished product is given. 7

ALUMINUM DESIGNATIONS—All-State Welding Alloys, Inc., White Plains, N. Y. Chart converting old aluminum type designations to the designations now in use. Included on the same sheet with the conversion chart are six other charts designed to aid in the selection of alloys and fluxes to weld, braze, and solder aluminum. 8

DIE-CASTING MACHINES — Hydraulic Press Mfg. Co., a Division of Koehring Co., Mount Gilead, Ohio. Bulletin 5700, describing the company's improved line of cold-chamber die-casting machines from 200 to 800 tons. A large cut-away view shows the construction features of the machine. Specifications and standard and optional equipment are covered. . 9

METAL SAWING—W. O. Barnes Co., Inc., Detroit, Mich. 36-page book entitled "Handbook of Metal Sawing," covering the proper selection and use of hand and power hacksaw blades and band saw blades. Selection of the correct

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blade for any job is simplified by charts. Recommended cutting speeds, feeds, and techniques are also tabulated. **10**

MACHINERY PARTS — Union Carbide and Carbon Corporation, New York City. Booklet describing the company's machinery parts made of Haynes alloy. It includes data on chemical compositions, physical and mechanical properties, corrosion resistance, and machining of Haynes alloy parts. **11**

STAINLESS STEEL FASTENERS — All-metal Screw Products Co., Inc., Garden City, N. Y. 12-page catalogue describing the company's stainless steel AN fasteners. Illustrations, stock sizes, principal dimensions, and explanation of part and dash numbers are included for each item. **12**

AIR MOTOR INCLINING DEVICE—Niagara Machine & Tool Works, Buffalo, N. Y. Supplement to bulletins 56, 57, and 58 introducing the company's fast-acting air motor inclining device available as optional equipment on Niagara Series E, A and AA open-back, inclinable presses (45- to 200-ton models). . . . **13**

STEEL DATA—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Revised edition of 256-page pocket-size data book giving helpful information on machining and fabricating, specifications and tolerances, weights and dimensions, and elements and safe loads. Tables, definitions, and general data are also included. **14**

DRILL STOP—Scully-Jones & Co., Chicago, Ill. Bulletin 18-50, describing the company's drill stop with a new micrometer depth adjustment for drilling and reaming applications. Diagrams and photographs are used to describe the construction and use of this tool. **15**

ABRASIVE WHEELS — Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. Catalogue 6465, serving as a comprehensive grinding wheel net price and data book. It lists rubber and resinoid-bonded grinding wheels and combines them in a convenient form. **16**

AIR CYLINDER — Bimba Hardware & Mfg. Co., Monee, Ill. Leaflet describing the company's Model 091 non-repair air cylinder, a single-acting spring-return air cylinder which can be used for clamping, moving, holding, ejecting, and several other operations. **17**

MILLING MACHINE—Producto Machine Co., Bridgeport, Conn. 8-page catalogue describing and illustrating the company's standard automatic production milling machine which features an accurate index mechanism as an integral part of its horizontal work-table. **18**

GAS LIQUEFIER — North American Philips Co., Inc., Mount Vernon, N. Y. 6-page folder giving engineering data on the Norelco gas liquefier. Folder is illustrated with photographs and drawings which show the operating cycle and construction of the machine. **19**

PIN-HOLE DETECTOR—General Electric Co., Schenectady, N. Y. Bulletin GEA-6520, giving information on capabilities and operation of the company's redesigned pin-hole detector for automatically inspecting fast-moving opaque strip for small holes. **20**

VALVES—Lunkenheimer Co., Cincinnati, Ohio. Catalogue entitled "Guide for Selecting Valves, Boiler Mountings, Lubricating Devices," describing the company's LQ600 bronze globe valves with Brinalloy seats and discs, and various other new equipment. **21**

TURKS HEAD—Fenn Mfg. Co., Newington, Conn. Catalogue illustrating the company's complete line of turks heads. Basic technical information is given and principles of operations and advantages as a precision production machine are explained. **22**

GENERAL-PURPOSE DIGITAL COMPUTER—Bendix Aviation Corporation, Los Angeles, Calif. 6-page bulletin describing the company's G-15D, general-purpose digital computer and its digital differential analyzer accessory. **23**

PRECISION CYLINDRICAL GRINDING MACHINES—Landis Tool Co., Waynesboro, Pa. 28-page condensed catalogue giving descriptions and specifications of the company's standard and single-purpose precision cylindrical grinding machines **24**

AUTOMATIC MULTIPLE TRANSFER PRESSES—Baird Machine Co., Stratford, Conn. Bulletin listing the latest developments in the company's line of automatic multiple-spindle transfer presses and detailing their basic principles of operation. **25**

TUBULAR FITTINGS — Myers Electric Products, Inc., Montebello, Calif. Catalogue describing the company's tubular fittings for leakage sealing pipe and conduit hubs through bulkhead as well as cap-off fittings. **26**

HYDRAULIC PLATE SHEAR — Pacific Industrial Mfg. Co., Oakland, Calif. 8-page catalogue describing the company's hydraulic plate shear. Complete specifications on controls, construction, and dimensions are included. **27**

ADAPTER FITTINGS—Parker Appliance Co., Cleveland, Ohio. Catalogue 4360, describing the comapny's straight-thread plugs and adapters, O-rings for straight-thread fittings, and steel and brass pipe fittings. **28**

FLEXIBLE COUPLINGS — Acme Chain Corporation, Holycke, Mass. Catalogue giving descriptive information on the company's flexible couplings. Engineering data, horsepower ratings, parts lists, and prices are included. **29**

POWER TOOLS—Boice-Crane Co., Toledo, Ohio. Catalogue describing power tools for the cutting, shaping, drilling, and finishing of wood, metal and plastics. Several new tools are also described. Specifications and illustrations of band saws, contour saws, band filers, cutters, and shapers are included. **30**

Product Information Service

Use postage-free Business Reply Card below for further information on New Catalogues or New Shop Equipment described in this issue and products mentioned in the advertisements.

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TIME DELAY RELAYS—A. W. Haydon Co., Waterbury, Conn. Bulletins TD404 and TD405, describing the company's adjustable time delay relays—one of the surface mounting type and the other of the flush mounting type. **31**

STAINLESS STEELS—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Catalogue entitled "Stainless Steel Types 308, 309, and 310," giving detailed information on these types of stainless steel. Information is also given on physical properties, heat-treatment, strength at elevated temperatures, fatigue strength, and resistance to oxidation. **32**

SINGLE-PASS TAP—Horspool & Romine Mfg. Co., Inc., Oakland, Calif. Catalogue describing the company's single-pass Acme tap. A complete list of stock sizes from 3/8- to 2 1/2-inch diameters are detailed. **33**

PRESS WELDER — Taylor-Winfield Corporation, Warren, Ohio. Bulletin 3-513, describing the company's type EQB size 3 1/2 press welder which meets welding requirements between RWMA standard sizes 3 and 4. . . . . **34**

WORK BLADES AND GUIDES—Cincinnati Grinders Incorporated, Cincinnati, Ohio. Catalogue GO678, describing the work blades and guides for the company's grinding and centerless lapping machines. **35**

ABRASIVE CUT-OFF MACHINES — Campbell Machine Division, American Chain & Cable Co., Inc., Bridgeport, Conn. Folder describing the company's abrasive cut-off machines. **36**

AUTOMATIC-CYCLE GEAR CHECKER—Michigan Tool Co., Detroit, Mich. Bulletin describing the company's automatic-cycle gear checker, its operation, and its capabilities. **37**

KNIVES AND EDGE TOOLS—Alcon Production Tool Co., Akron, Ohio. Catalogue containing data and specifications on the company's line of machine knives and edge tools. **38**

ULTRASONIC INSPECTION — Curtiss-Wright Corporation, Caldwell, N. J. Leaflet describing the company's ultrasonic inspection unit for immersed non-destructive testing. **39**

WELDING ELECTRODES—Ampco Metal, Inc., Milwaukee, Wis. Bulletin RW-10, describing the company's complete line of resistance-welding electrodes and accessories. **40**

TRACTOR TOOLS—Hyster Co., Portland, Ore. Catalogue giving information on the company's complete line of tractor-mounted accessories for Caterpillar-built tractors. **41**

DRILLING AND TAPPING UNITS—Hy-PneuMat Inc., Milwaukee, Wis. Catalogue describing the company's automatic air- or hydraulic-powered drilling and tapping units. **42**

COLD-HEADED FASTENERS — John Hassall, Inc., Westbury, N. Y. 4-page catalogue covering the design and manufacturing advantages of cold-headed fasteners and parts. **43**

STEEL SPRINGS—Alco Products, Inc., Schenectady, N. Y. 16-page bulletin describing the company's production of hot- and cold-wound steel springs. . . . **44**

BENCH-MODEL COMPARATOR — Jerpbak-Bayless Co., Solon, Ohio. Folder describing the company's bench-model comparator and giving information on available accesories. **45**

ALLOY CHAIN DATA—S. G. Taylor Chain Co., Inc., Hammond, Ind. Wall chart giving information on the proper use of alloy chains and alloy slings. . . **46**

TOTALLY PROTECTED MOTORS—Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin B-2501, describing the company's totally protected industrial motors. **47**

TEMPERATURE SELECTOR GUIDE — Techalloy Co., Inc., Rahns, Pa. Chart giving data on comparative strengths of high-temperature, heat-resisting alloys. **48**

JIG BORER—M. B. I. Export & Import Ltd., New York City. Bulletin describing the company's horizontal optical jig borer designated Dixi 60. . . . . **49**

BALANCING MACHINES — Stewart-Warner Corporation, Chicago, Ill. Catalogue 24-1, describing the company's dynamic balancing machines. **50**

BALL BUSHINGS—Thomson Industries, Inc., Manhasset, N. Y. Folder describing the company's adjustable-diameter ball bushings. **51**

BAND SAWS—Tannewitz Works, Grand Rapids, Mich. Leaflet describing the company's line of high-speed band saws. **52**

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LUBRICANT ADDITIVE—Climax Molybdenum Co., New York City. 12-page bulletin explaining the function of the company's Moly-Sulfide—a lubricant additive—and describing its commercial uses. 53

ULTRASONIC SOLDERING IRON—Acoustica Associates, Inc., Glenwood Landing, N. Y. Bulletin SOL-109, describing ultrasonic soldering of aluminum and other light metals. 54

RESEARCH REACTORS—Atomic Power Equipment Department, General Electric Co., Schenectady, N. Y. Bulletin GEA 6326-B, describing the characteristics and uses of three research reactors now being offered for sale by the department. 55

ENCLOSED SWITCHES—Micro Switch, a Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Catalogue 77, describing the company's enclosed switches for airborne equipment. ...56

DIE-CASTING MACHINE—Cleveland Automatic Machine Co., Cincinnati, Ohio. Bulletin describing and illustrating the company's Model 600 Cleveland die-casting machine. 57

RE-RATED MOTORS—Robbins & Myers, Inc., Industrial Motor Division, Springfield, Ohio. Bulletin featuring the company's Series 254-U All-Weather re-rated motors. 58

HIGH-SUCTION CLEANER—Vac-U-Max Sales Co., Belleville, N. J. Catalogue describing the company's high-vacuum industrial cleaner. 59

GRINDING MACHINE—Gardner Machine Co., Beloit, Wis. 8-page catalogue describing the company's 2H30, precision grinding machine. 60

DIAL SNAP GAGES—Standard Gage Co., Inc., Poughkeepsie, N. Y. Catalogue describing the company's dial snap gages. 61

SPRING WINDER—O'Neil-Irwin Mfg. Co., Lake City, Minn. Catalogue describing the company's Di-Acro spring winder. 62

PRECISION TOOLS—R and L Tools, Philadelphia, Pa. 32-page illustrated catalogue describing the company's precision tools. 63

ALIGNMENT TESTING—Engis Equipment Co., Chicago, Ill. Brochure dealing with alignment testing—part of a series of technical papers published by the company for the advancement of metrology. 64

OIL-TIGHT AND GENERAL-PURPOSE PUSH-BUTTONS—Furnas Electric Co., Batavia, Ill. 32-page catalogue covering the company's oil-tight and general-purpose push-buttons, pilot lights, and accessories. Catalogue includes description of components and complete units, dimensions, cam action, and schematic diagrams. All types and styles are photographically illustrated. 65

AIRCRAFT SWITCHES—Micro Switch, a Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Catalogue 78, entitled "Basic Switches for Airborne Equipment," covering the company's complete line of phenolic encased aircraft switches as well as small, metal-covered hermetically sealed switches and high-temperature switches 66

SOCKET SCREWS—Standard Pressed Steel Co., Jenkintown, Pa. Folder describing the company's microsize Unbrako socket screws—especially designed for electronic equipment, industrial and scientific instruments, and other precisely-built compact products which require small, exceptionally strong fasteners. 67

IRON-POWDER ELECTRODES—Hoeganaes Sponge Iron Corporation, Riverton, N. J. Bulletin presenting technical data and welding performance of iron-powder electrodes and also on the company's iron-powder, Ancor W-428, used as a coating of the rods. 68

PORTABLE ELEVATING TRUCKS—American Pulley Co., Materials-Handling Division, Philadelphia, Pa. Catalogue HE-56 describing and illustrating the company's portable elevating trucks. Full specifications are included. 69

AUTOMATIC CONVEYOR LUBRICATORS—J. N. Fauver Co., Inc., Detroit, Mich. 8-page catalogue describing the company's "100 Series" and "700 Series" automatic conveyor lubricators. 70

CLOSE-COUPLED INDUSTRIAL PUMPS—Layne & Bowler Pump Co., Los Angeles, Calif. Bulletin 1100 describing the company's Verti-Line of close-coupled industrial pumps. 71

ARC-WELDING MACHINES—Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York City. Catalogue 1340 describing the company's arc-welding machines and accessories. 72

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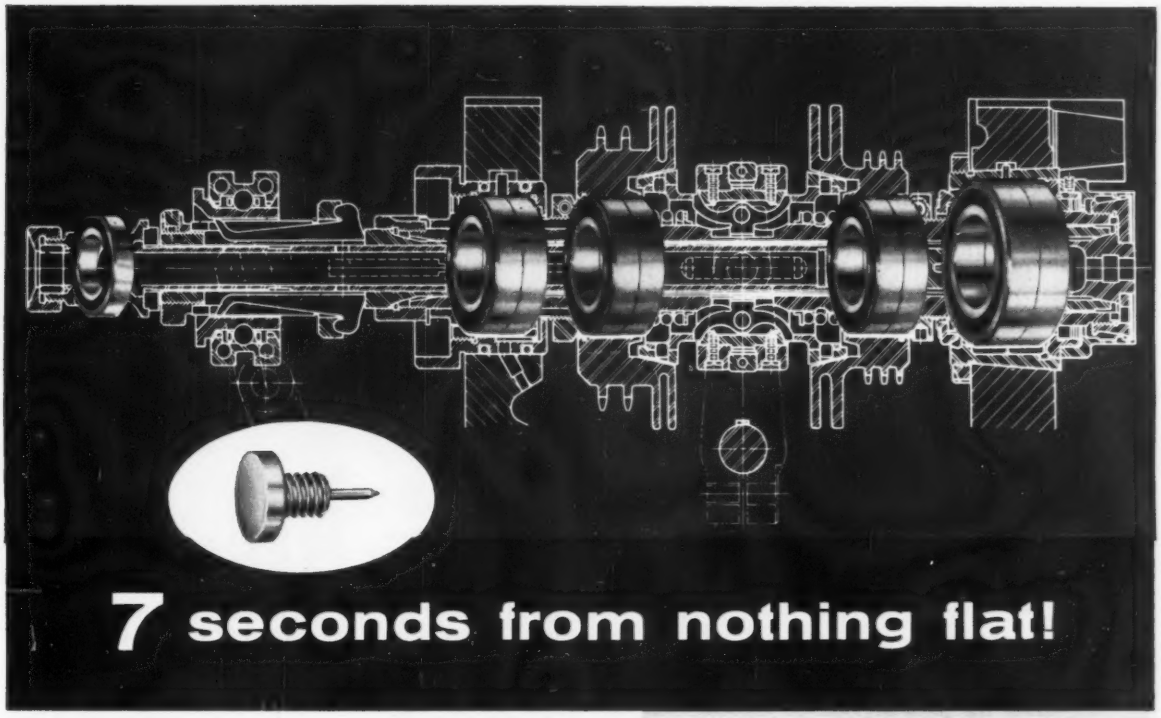
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7 seconds from nothing flat!

The brass part illustrated below the diagram is produced on the new 00 Brown & Sharpe Automatic Screw Machine in 7 seconds. That represents a 42% increase in production over the previous model.

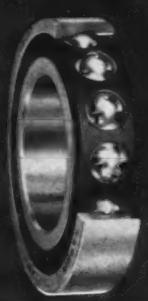
To step up production by such a substantial percentage involved the development of new and exclusive features for the 00 machine over and above those proven so successful on the previous model. Included among them is the chain-driven, ball bearing spindle . . . see large diagram above.

In the selection and application of the bearings for the 00 spindle, Fafnir engineers worked with Brown & Sharpe engineers. The 208 speed combinations from a high of 7200 RPM to a low of 34 RPM, permitting high cutting efficiency on a wide range of materials, presented no ordinary problem for bearings. The bearing arrangement shown meets an exacting demand for maximum radial and axial rigidity to assure true balance and running accuracy of the spindle.

Could be there's no place in your machines for these super-precision bearings. But, whenever bearings are involved, there's certainly a place in your product planning for the Fafnir "attitude and aptitude" — a way of looking at bearing problems from the designer's viewpoint plus coming up with the right bearing to fit the need. Ask your Fafnir representative for details. The Fafnir Bearing Company, New Britain, Conn.

The New Brown & Sharpe No. 00 Automatic Screw Machine with Fafnir-equipped spindle.





Fafnir preloaded, angular-contact, super-precision ball bearings with composition or brass retainers are made to highest industry-approved tolerances. Single or duplex bearings like this are used widely on spindle applications.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

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King Electrically Operated Vertical Turning and Boring Machines

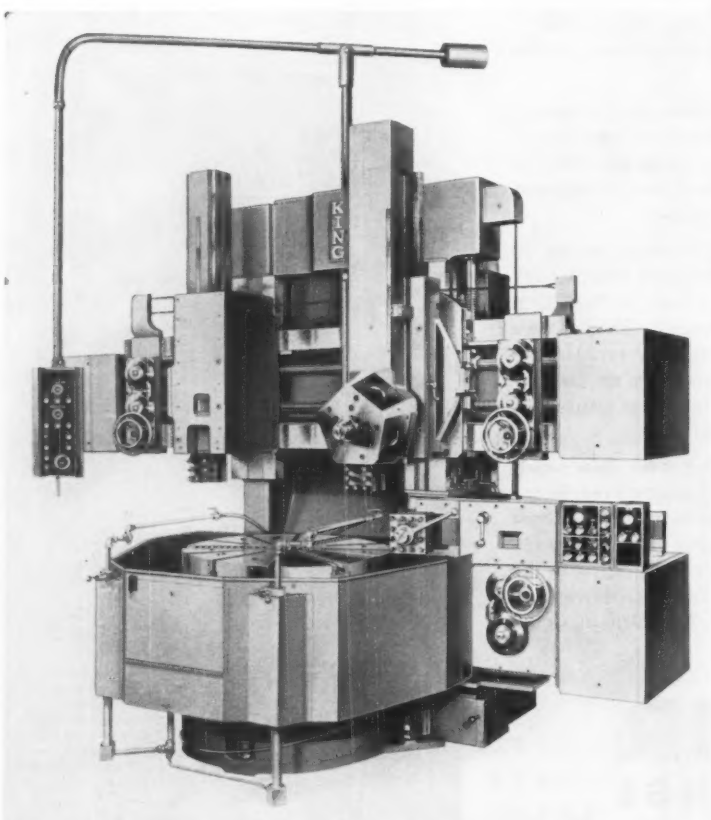
Completely redesigned King vertical boring and turning machines incorporating many advanced construction and operating features have been announced by the American Steel Foundries, King Machine Tool Division, Cincinnati, Ohio. These machines are fully electrical in operation. All controls are conveniently located on the movable pendant station and on an auxiliary control panel mounted on the machine in a readily accessible position.

Both feeds and speeds are preselective from direct-reading dials. Ranges of feeds and speeds have been expanded, providing twenty-four feeds from 0.0016 to 0.250 inch per table revolution, and twenty-four speeds in any one of three standard ranges designated low, intermediate, and high. Driving power has been stepped up to a range of 40 to 50 H.P. on 30-, 36-, and 46-inch sizes, and up to 75 to 100 H.P. on 56-inch and larger sizes.

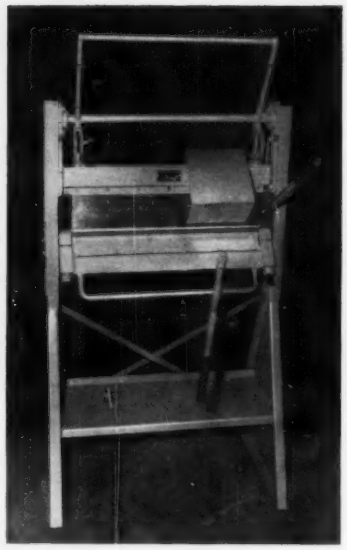
Other features include an improved spindle and spindle mounting that provides maximum table stability with increased machining accuracy; unit construction of spindle drive for easier maintenance; anti-backlash nuts for all cross-feed movements; and automatic lubrication of all moving parts.

The 46-inch machine illustrated is equipped with ram and turret head on rail, side-head, and coolant pan. The new machines are available in 30-, 36-, 46-, and 56-inch sizes and up, in a wide variety of head combinations, with or without a side-head to suit specific applications.

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King electrically operated 46-inch vertical turning and boring machine of improved design



Bending and forming brake made by Percy L. Cady

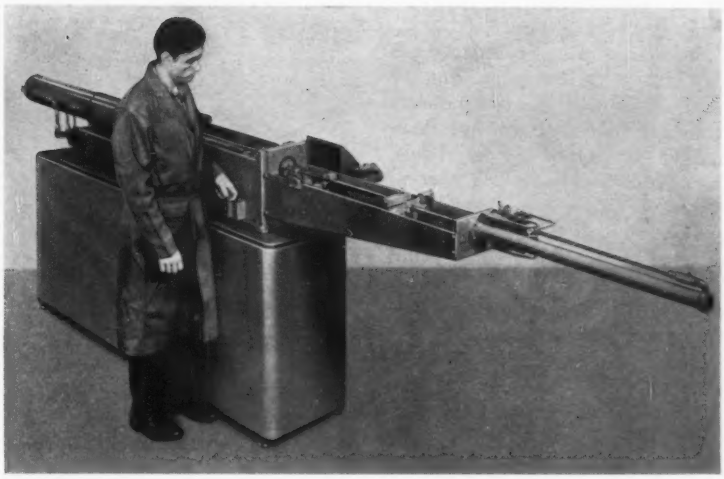
Bending and Forming Brake

A bending and forming brake having two aprons is being manufactured by Percy L. Cady, Darien Center, N. Y. Provision is made for using the brake with only one apron in the conventional manner.

When the two aprons are used channels are made by bringing the formed side up until it touches the upper forming blade, then bringing the other leg or side up to a 90-degree position. This method of forming allows the channels to have a flange of almost unlimited length. Radius bending or forming to radii equal to the thickness of the metal and up to a radius of 1 inch can be done by making standard adjustments and using an upper forming member of the proper diameter. Larger radii, up to 3 inches, can be formed by replacing the lower forming blades with a filler piece in the yoke. On some materials, the filler piece is not necessary. Although a 3-inch maximum radius is standard, brakes with larger radii capacity are easily made to suit customer's specification.

Conical and tapered-section forming, reverse bending, tab forming, and various other kinds of work can be handled on this brake.

Circle Item 132 on postcard, page 239



Broaching equipment with Red Ring self-contained semi-automatic fixture announced by the National Broach & Machine Co.

Red Ring Self-Contained Broaching Fixture

A Red Ring self-contained, air-powered broaching fixture that includes automatic broach-handling and part-ejection devices with provision for semi-automatic loading is available from the National Broach & Machine Co., Detroit, Mich. In addition to the tandem air-hydraulic cylinder that pulls the broach through the part, the fixture has a second air cylinder which operates a broach-retriever mechanism. A third air cylinder operates a part-ejection device.

Maximum operator safety and production efficiency are said to be achieved by the semi-automatic loading features of the new fixture. A part is loaded on a locating platform, and a cycle-starting valve is actuated. Then the part is broached in a fully automatic cycle and automatically ejected.

The unit illustrated broaches a round hole in each of two bushings (3/8 inch in diamter by 1 inch long) that are pressed in a die-cast electric windshield wiper bracket. The in-line bushings are about 4 inches apart. The holes are broached to the required diameter within a tolerance of 0.001 inch and must be in line within 0.0005 inch. A combination broach-burnisher tool is used in an eight-second machining cycle.

The broaching fixture illustrated has a stroke of 25 inches. Maximum pull force of the fixture is 1450 pounds, and the maximum broach speed is 70 feet per minute. The fixture is designed to be bench-mounted, but it can be furnished with a steel base.

Circle Item 133 on postcard, page 239

B & S Automatic Forming and Cutting-Off Machines

Two new types of No. 00 automatic screw machines have been announced by the Brown & Sharpe Mfg. Co., Providence, R. I. These machines are designed for jobs that can be handled advantageously without reversing the machine spindle. Both machines have exceptionally high spindle speeds, up to 10,000 R.P.M., which serve to increase efficiency when processing free-machining materials. A wide range of lower speeds—down to 630 R.P.M.—provides for efficient operation on the tougher alloys.

The Type 1 machine has a turret and vertical slide and is identical with the automatic screw machine except for the nonreversing spindle. It is designed for drilling, reaming, facing, turning, forming, knurling, cutting off, and similar work.

The Type 2 machine does not



Brown & Sharpe automatic with high-speed, nonreversing spindle

have the vertical slide, and the turret is replaced by a one-tool position slide. It is designed to handle all types of form and cut-off work with high efficiency.

Both machines are full 1/2-inch capacity models and have all the time-saving features incorporated in the No. 00 screw machine.

Circle Item 134 on postcard, page 239

Diebel Automatic Press

The Di Machine Corporation, Chicago, Ill., has announced the addition of a 150-ton press to its line of Diebel Hi-Production automatic presses. This press includes as standard equipment the Diebel-engineered cylindrical ram; increased bearing surfaces; air clutch and spring-applied brake; special shock mounts; and safety shut-off devices.

The press bed is 40 inches left-to-right by 32 inches front-to-back, or 56 inches left-to-right by 32 inches front-to-back. The width of feed is 18 inches and the length of feed 0 to 13 5/8 inches. The speed range is from 70 to 210 surface feet per minute.

Circle Item 135 on postcard, page 239

Leitz Optical Comparator

An 8-inch optical comparator is the first of a complete line of Leitz super-precision comparators to be introduced to the American market by Opto-Metric Tools, Inc., New York City. This comparator employs a vertical beam of light, which permits the work stage to be located in a horizontal plane so that the work is simply laid on the stage. Thus, measurements from left to rear, can be easily obtained. The optical equipment of the comparator is designed to produce an image of exceptional accuracy and sharpness on the screen.

Other features of this comparator are a quick-indexing objective turret for 10X, 20X, and 50X magnification; a retractable vertical illuminator for reflected images in all three magnifications; selective filters to give increased contrast in transmitted, as well as reflected light; a rapid-acting, two-dimensional stage for locating work against charts; and a rotating circular screen for angular measurements.

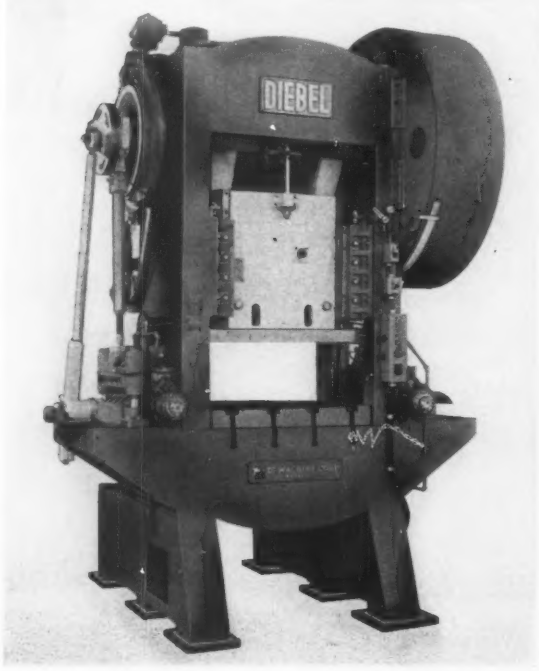
Circle Item 136 on postcard, page 239



Fenway portable nibbler

Air-Powered Nibbler

A pneumatic metal-cutting tool has just been added to the line of portable metal-cutting nibblers manufactured by the Fenway Machine Co., Philadelphia, Pa. This tool will cut at the rate of 55 inches per minute through 10-gage stainless steel without distortion on either side of the cut, leaving the edge ready for fabricating. The cutting operation is effortless because of actual metal displacement. A short turning radius facilitates the cutting of intricate patterns and special



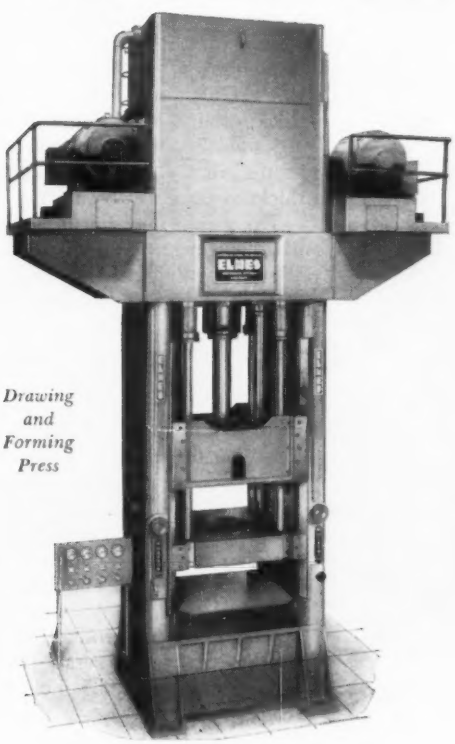
Diebel 150-ton Hi-Production automatic press announced by Di Machine Corporation



Optical comparator with vertical light beam introduced by Opto-Metric Tools, Inc.



"Job-Fitted" HYDRAULIC PRESS



Drawing and Forming Press

Those tough production problems that require something extra in drawing, forming, bending, hobbing, forging or other press performance are just the kind that Elmes engineers like to be called in on. More than 60 years in the specialized field of hydraulics has built the Elmes reputation for recommending and supplying hydraulic presses that are "job-fitted" for profit-making performance, no matter how special the job.

While a wide range of standard Elmes Press designs meet all usual requirements in drawing, forming and other press work, the development of special presses "job-fitted" to the customer's exact requirements is a major part of Elmes engineering service. Whatever your pressing problem, it will pay you to call in Elmes for consultation and recommendations. Distributors in principal cities.

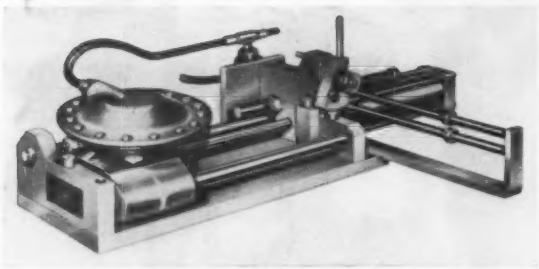
American Steel Foundries

Elmes ENGINEERING DIVISION

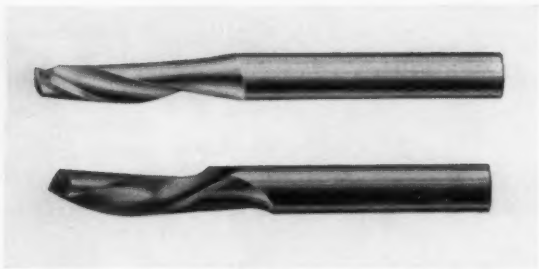
1162 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

For more information fill in page number on Inquiry Card, on page 239



"Ses-Matic" feeding unit for punch presses



Solid carbide routing tools made by the Atrax Co.

openings in sheet metal without the use of special devices.

The nibbler weighs 13 pounds and is 13 inches long; its strong, lightweight frame is constructed of cast aluminum. Anti-friction bearings on all rotating parts, hardened precision-cut gears, and push-button air valve attachment are other features of the tool.

The tool is operated by a heavy-duty, precision-built, 5-H.P. Cleco air motor, two-stage compressor using 30 cubic feet of air per minute at a pressure of 90 pounds per square inch. Its capacity is 10-gage stainless, nickled, or cold-rolled steel and galvanized iron; 8-gage mild steel, aluminum, brass, and other softer metals. The minimum cutting radius is 6 inches.

Circle Item 137 on postcard, page 239

"Ses-Matic" Air-Operated Units for Feeding Coiled Stock to Punch Presses

A series of air-operated units for feeding coiled stock into punch presses was recently introduced by Special Engineering Service, Inc., Detroit, Mich. A practical feature of these air feed units is their mobility. They are designed for direct mounting on the bolster plate of the press.

The feeding units are available for maximum stock widths of 8, 12, and 18 inches, and maximum feed stroke lengths of 8, 12, and 18 inches. They are adjustable for both width and stroke length from their maximum length to 0. The thickness of stock that can be handled is dependent on the stock width; specifically 5/32 inch thick up to 8 inches wide; 0.125 inch thick up to 12 inches; and 0.093 inch thick up to 18 inches wide. The stock is fed on the up stroke of the press and is guided at both the front and rear of the "Ses-Matic" air feed.

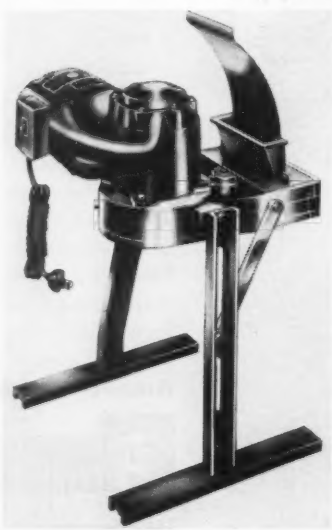
Circle Item 138 on postcard, page 239

Atrax Solid Carbide Routing Tools

The Atrax Co., Newington, Conn., has brought out a line of solid carbide routers which are precision-ground to close tolerances for use on abrasive materials such as plastics, Bakelite, die-castings, copper, fiber, bronze, brass, aluminum, hardwood, and hard rubber. The routers are designed for high speeds, fast cutting action and to produce a fine finish.

A full range of standard sizes are available in all series such as single straight flute, single right-hand spiral, single left-hand spiral, two-flute straight, two-flute left-hand spiral and three-flute left-hand spiral—all designed to do a specific job.

Circle Item 139 on postcard, page 239



Scrap-chopper for press brought out by Cooper Weymouth, Inc.

Scrap-Chopper for Presses

Cooper Weymouth, Inc., Stratford, Conn., has brought out a press-room accessory, called scrap-chopper, which takes scrap stock as it leaves the press and, by a unique orbital shearing action of hardened steel blades, chops it into a size easily and economically stored for collection. This eliminates scrap-handling problems and saves space.

The unit can be tipped at any angle to facilitate feeding the material. The chute through which material passes to the cutting blades has a reciprocating action which prevents the stock from "hanging-up" and keeps it feeding freely. Cutting blades are 3/8 inch thick, ground on one surface only, are self-aligning, and can be reground down to half the original thickness and still be used.

The unique cutting action, unlike the conventional scissors type, allows openings of the same size at each end of the cutting blades thus permitting free entrance of material through the blades. If stock that is too thick is accidentally fed between the blades, the chopper simply stalls without danger of breakage.

The scrap-chopper is powered by a 1/3-H.P., 115- or 230-volt, single-phase, 60-cycle driving motor. The unit comes complete with off and on switch, and length of electrical cord, ready for use. The model now in production will handle mild steel scrap stock 6 inches wide by 0.065 inch thick.

Circle Item 140 on postcard, page 239



Geared pipe threader announced by the Ridge Tool Co.

Geared Pipe Threader with Jamproof Kick-Out

The Ridge Tool Co., Elyria, Ohio, has announced that its 4 PJ 2 1/2- to 4-inch geared pipe threader is now equipped with an automatic drive kick-out that makes it jamproof. This jamproof tapper is said to make threading with power drives as safe as by hand and to eliminate the necessity for watching the die stock and power drive while threading.

After each standard length thread is cut, the drive pinion on the tapper kicks out automatically and prevents jamming. Possibility of damage to equipment or personnel is thus eliminated. Gears are all fully enclosed, and there are no bushings to require attention.

Circle Item 141 on postcard, page 239

Cincinnati Heavy-Duty Shaper

A 32-inch Cincinnati heavy-duty rigid shaper equipped with an integrally mounted boom crane designed to simplify operator handling of heavy workpieces and fixtures is a recent development announced by the Cincinnati Shaper Co., Cincinnati, Ohio. Other features of this versatile shaper include a nodular iron ram; pressure lubrication system operating at a pressure of 50 pounds per square inch; electromagnetic clutch and brake; automatic tool lifter; and a universal table.

Circle Item 142 on postcard, page 239

Hamilton Gap Presses

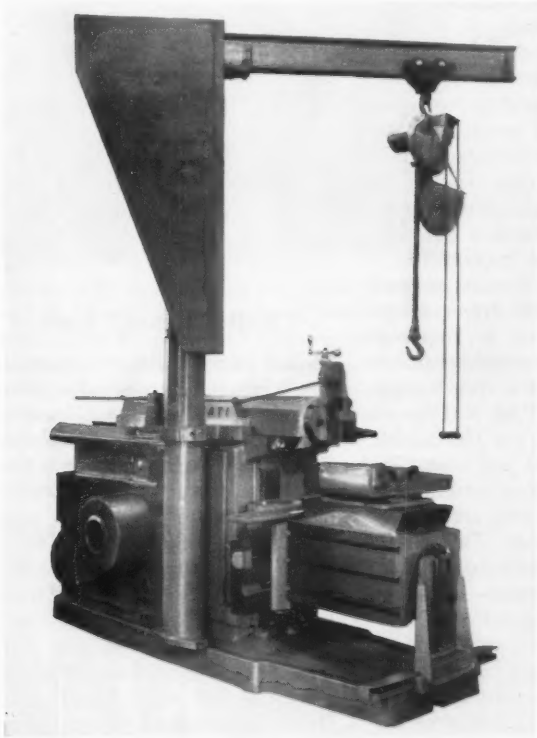
A line of gap presses ranging in capacity from 100 to 300 tons in both single- and double-crank types is now available from the Hamilton Division of the Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio. These presses have been developed primarily for shallow drawing, forming, and blanking operations in the automotive industry but can also be used in other fields such as the appliance industry.

The presses have bed areas large enough to accommodate blanks that are formed into autobody grille and bumper guards.

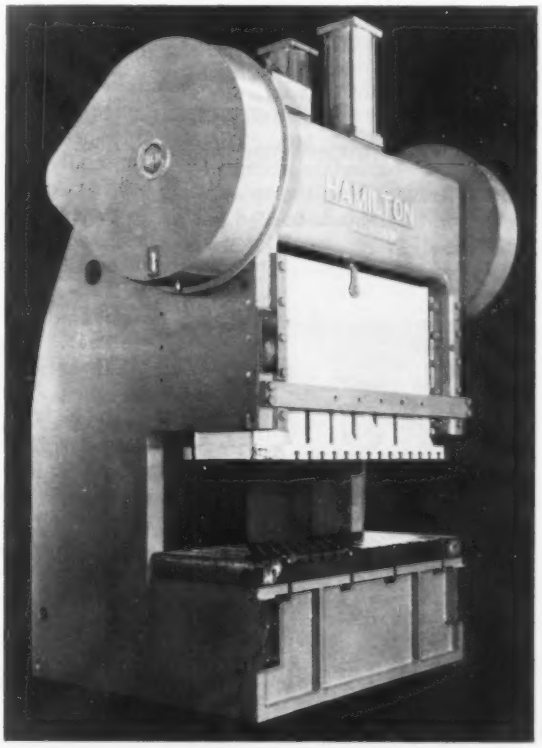
The presses incorporate a pneumatically operated flywheel brake, pneumatic clutch with electric control system and pneumatic counterbalance.

Mechanical interlocking between clutch and brake is said to assure optimum performance and safety. Single-stroke tripping of the clutch is possible at speeds very close to the continuous operating speed.

Circle Item 143 on postcard, page 239



Heavy-duty rigid shaper equipped with boom crane announced by the Cincinnati Shaper Co.



Gap press of line announced by the Hamilton Division of Baldwin-Lima-Hamilton Corporation



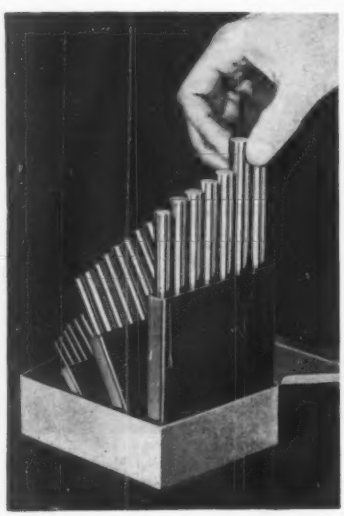
Thor Lightweight Air Grinder

Lightweight 6-inch air grinder announced by the Thor Power Tool Co., Aurora, Ill., with improved powerful motor. This tool is part of the company's No. 4 series of industrial air tools. The new Thor 4G series of air grinders is being produced in twelve models—four different speeds and three different throttle types. It has fewer parts and has a five-blade type motor with a one-piece rotor and shaft, and supersedes the company's 250 series. The new model is available in speeds of 4500, 6000, 9000, and 12,000 R.P.M.

Circle Item 144 on postcard, page 239

Ace Hardened High-Speed Steel Drill Blanks

One of four sets of hardened, high-speed steel drill blanks covering a range of 182 standard stock sizes announced by the Ace Drill Corporation, Adrian, Mich. These blanks are centerless-ground to close tolerances from the same selected, uniformly heat-treated material used in the production of Ace ground-from-the-solid drills.



They are intended for use as knockout pins, punches, dowel-pins, gages, and rollers for high-temperature applications. A wide variety of end-cutting tools such as routers, countersinks, spotfacers, end-mills, tool blanks for boring bars, reamers, and cutting teeth for inserted cutters can also be made up quickly from these blanks.

Circle Item 145 on postcard, page 239



G-E Tachometer Generators

Small-diameter tachometer generators for industrial applications such as speed measuring and regulation have been developed by the Specialty Component Motor Department of the General Electric Co., Schenectady, N. Y. This line includes both alternating- and direct-current models designed for incorporation into variable-speed drive systems. They are totally enclosed units of ball-bearing construction and have protected terminals located in an easily accessible conduit box. The alternating-current tachometer is used for speed indication on steel and aluminum mill drives where moderate accuracy is required. The four-pole, alternating-current tachometer serves a speed range of 400 to 5000 R.P.M. and has an output of 28 volts per 100 R.P.M., plus or minus 10 per cent. The compact, alternating-current generator is 6 inches long and weighs less than 4 pounds. The direct-current tachometer is designed for very accurate speed indication and feed-back regulation. It will supply enough power to operate one instrument and one recorder. When used with suitable instrumentation, the direct-current unit will measure rotational speeds from 100 to 5000 R.P.M.

Circle Item 146 on postcard, page 239



Multiple Grooving Tool

Multiple grooving tool with twelve Kendex button inserts developed and fabricated by Kennametal Inc., Latrobe, Pa., for a special cutting operation. Each of the indexable "turn-over" button inserts is 1/2 inch in diameter and is backed by Kennametal shims. Each insert has a number of cutting edges on both the top and bottom surfaces, the number depending on the depth of cut. The 8-inch long steel plate that backs up the inserts assures accurate groove spacing when the inserts are indexed to obtain new cutting edges. The inserts are made of Kendex Style SC-162.

Circle Item 147 on postcard, page 239



"Roll-A-Bench" Unit

"Roll-A-Bench" that permits bench, vise, and tools to be rolled directly to the work location brought out by the Overbeke-Kain Co., Bedford, Ohio. This sturdy, all-steel unit can be locked to the floor to insure the most effective use of the vise or other equipment, such as pipe-threading and die-handling tools. The truck is fabricated of 1/8- and 3/16-inch steel plate. It will support 2000 pounds on the 3/16-inch top and can be moved easily by one man. Heavy-duty roller-bearing casters are furnished with optional tires of hard rubber or plastic. Extension cord and "plug-in" recepta-

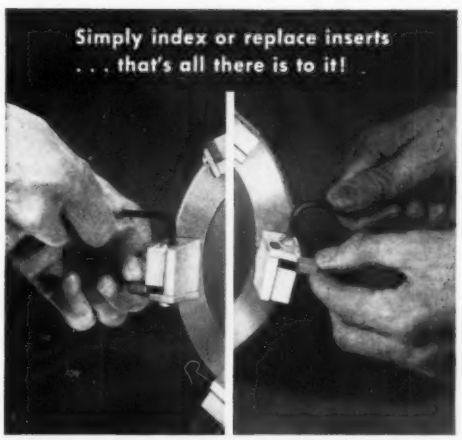
You change only the throw-away insert

. . . not the cutter body



WITH NEW V-R ALL-PURPOSE FACE MILL CUTTERS

- **Save downtime . . .**
- **Reduce lost production . . .**
- **Eliminate carbide grinding . . .**
- **Reduce carbide costs**



You get eight cutting edges with each V-R square carbide insert. Replacement and indexing takes but seconds, thanks to V-R's exclusive design. The single main screw controls the elevator which clamps the insert against the chipbreaker plate. A recessed socket in each end of the main screw makes insert replacement fast and easy, regardless of the position of the cutter. There is nothing to fall out, nothing to fumble with.

All parts are replaceable and interchangeable.



Inserts are Inexpensive . . .
Lost Production is Costly

You do not remove the cutter body when cutting edges are worn in V-R's rugged new all-purpose Face Mill Cutter. Precision ground square V-R carbide throw-away inserts index perfectly just by slipping them in position and tightening the main screw. When using a negative rake cutter, you get eight cutting edges on every insert. When the inexpensive inserts are used up, throw them away and replace with new ones.

V-R Face Mill Cutters reduce downtime, *completely eliminate carbide grinding* and save money. They are available in 4″, 6″, 8″ and 10″ standard sizes. Other sizes available to meet your requirements.

Ask for new Bulletin for complete information.

Call your local V-R Representative or Distributor, or write:

MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

836 Market Street • Waukegan, Illinois

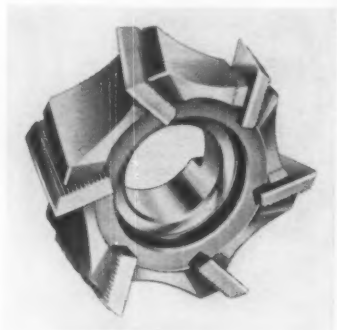
FM-567

cles can be furnished to permit use of electrical tools. The bench is 34 inches high, 41 inches long, 26 inches wide, and weighs 325 pounds. The interior is fitted with two shelves, a steel drawer, and a large area for chain falls, large tools, etc.

Circle Item 148 on postcard, page 239

Shell End-Mill for Light Metal Alloys

Inserted high-speed steel blade shell end-mill of standardized series brought out by Goddard & Goddard Co., Detroit, Mich., for machining aluminum and light

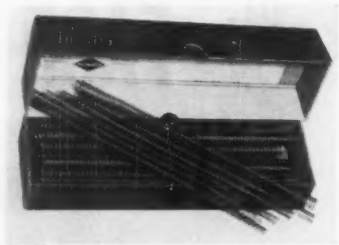


metal alloys. These specially designed tools, designated the WND series, cover the most widely used sizes of this type for milling aluminum. Diameters range from 3 to 8 inches, and over-all widths from 1 5/8 to 2 inches, in either the right- or left-hand cutter types. Chip pockets are polished for free-flowing chip disposal. All cutters can be provided with corner radii. Serrated wedges lock the cutter body and blades which can be adjusted outward radially in increments of 1/16 inch.

Circle Item 149 on postcard, page 239

Packaged Assortment of Small-Diameter Die Springs

A special assortment of small-diameter die springs is available from the Producto Machine Co., Bridgeport, Conn. This No. 40 die spring assortment contains forty different wire sizes in eight spring diameters ranging from 3/32 to 1/2 inch. The springs are supplied in 10-inch lengths, with open ends, and are packaged for convenient storage and selection. Refill packages of twelve springs of a size are also available, enabling the diemaker to keep an adequate supply of each size on



hand at all times. Springs made from wire up to 0.075 inch in diameter are wound from music wire. Those made from larger wire are of carbon steel.

Circle Item 150 on postcard, page 239

Simonds Abrasive Wheel

Abrasive wheel with "IL" bond developed by the Simonds Abrasive Co., Philadelphia, Pa. The new "IL" bond acts as an internal lubricant to increase the abrasive cutting action of resinoid-bonded wheels. Abrasive wheels made with this bonding material are recommended for use in steel mills, foundries, and industry in general since they combine the fast cutting action of soft grades with the long wearing qualities of hard wheels. The wheel is available with Simonds "Red Streak" flanges for heavy-duty snagging.

Circle Item 151 on postcard, page 239

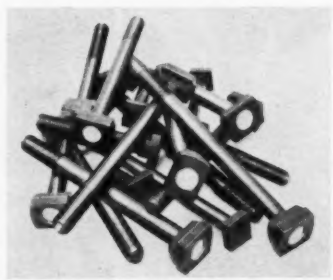




Wesson "No Grind" Chamfering Tool-Holder

One of two new series of holders for indexable and disposable carbide tips added to the Wesson line of metal-cutting tools manufactured by the Wesson Co., Detroit, Mich. This holder takes triangular inserts with six cutting edges. It is designed for 30-degree chamfering. A second series for 45-degree chamfering uses square throw-away inserts with eight cutting edges. Both holder series have carbide-faced, adjustable combination chip-breaker clamps and replaceable standard parts.

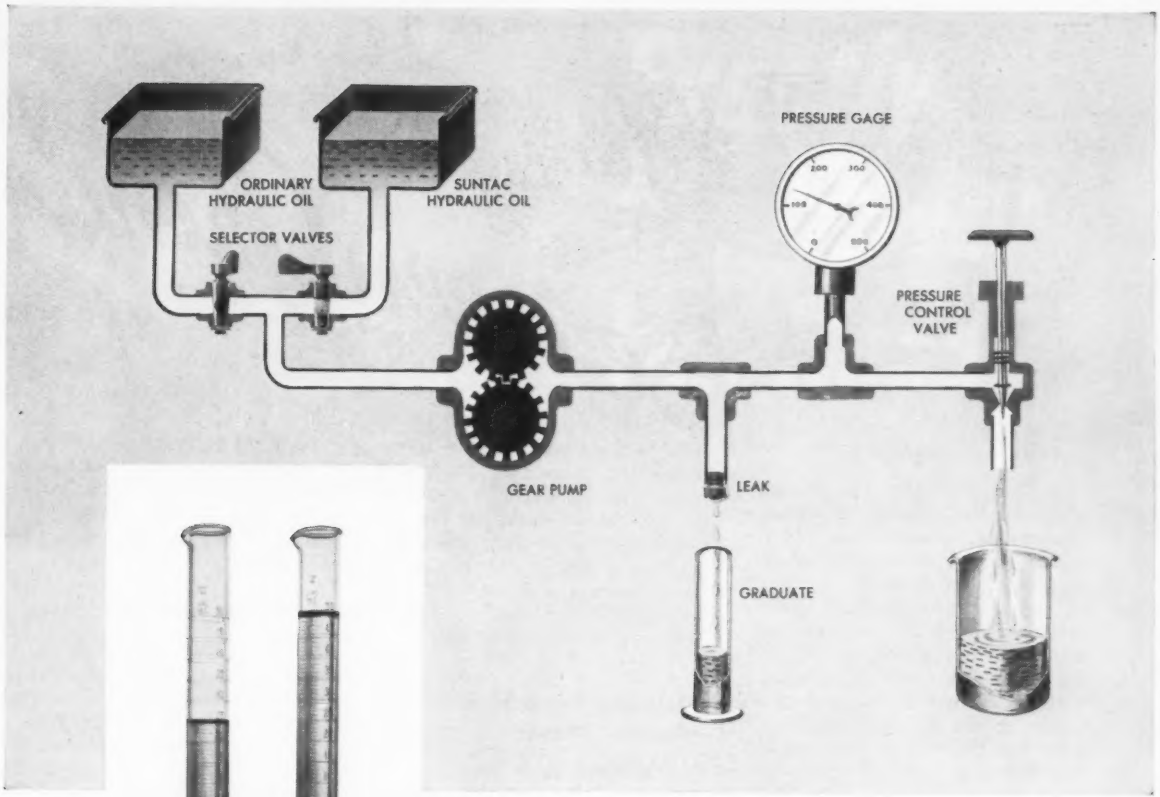
Circle Item 152 on postcard, page 239



Forged T and T-Slot Bolts

Forged T and T-slot bolts of the "Blue Chip" line recently announced by the Jergens Tool Specialty Co., Cleveland, Ohio. These bolts are said to be two to three times as strong as ordinary bolts, being made of aircraft quality alloy steel and heat-treated to provide a minimum tensile strength of 150,000 pounds per square inch. The bolts are formed in one piece by a special forging technique with dies that control the inherent fiber-like structure of the steel so that the flow lines, similar to the grain in wood, provide maximum strength at all critical stress points. After forming, the bolts are precision-machined to assure proper fit in table slots.

Circle Item 153 on postcard, page 239



The leak rate of ordinary oil vs. Suntac was measured in test machine simulating a typical leak in a hydraulic system. Oil viscosities were equal, time and pressure conditions identical. The simple act of switching from the ordinary oil to Suntac, *without any other changes*, reduced oil leakage by 50%.

PRESSURE SYSTEM DESIGNED TO LEAK PROVES SUNTAC CUTS OIL LOSSES UP TO 50%

If you're having troubles with excessive oil leakage, a Suntac® oil can help you. Because of their unusual anti-leak characteristics, Suntac oils reduce oil consumption up to 90%, users report.

Suntac oils will not gum up or otherwise harm circulating systems. These oils are high-quality petroleum products with a life expectancy longer than that of ordinary hydraulic and circulating oils.

A change to a Suntac oil can lower your oil costs... improve housekeeping... result in safer working conditions.

Your Sun representative can tell you more about Suntac oils. Or write for Technical Bulletin 23. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-2.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

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For more information fill in page number on Inquiry Card, on page 239



Between Grinds

By E. S. Salichs

Sermons in Signs

In the Convair, San Diego, plant of the General Dynamics Corporation, posters have been placed around strategically which emphasize the comparative cost of the equipment machine operators are running. For example, one sign shows photographs of a Cadillac automobile, with the notation that the car cost $5500, and of a fixture on the operator's machine, with the legend that the fixture cost $6000.

Potomac Potential

At the Rockwell Spring & Axle Co., socket-head screws made of standard SAE alloy broke after four or five days of normal operation in a press that hot-formed truck axle housings. By switching to Potomac die steel bolts (on recommendation of an Allegheny Ludlum engineer), the life of the head screws was increased "by almost 1000 per cent." An indication of improvement we figure.

Electronic Brain Has Nautical Waves

The United States Navy recently demonstrated to members of the press how the IBM 702 electronic data processing machine is being used in the Philadelphia Aviation Supply Office to provide naval aircraft based around the globe with parts and equipment they need, 50 per cent faster than before. A typical jet aircraft, it was duly noted, has over 33,000 different parts, many of them peculiar to that type of plane.

In Round Numbers

Louis Polk, president of the Sheffield Corporation, recalled this story in his talk entitled "Infinity in Action." During World War II, two apprentices were discussing the difficulty of working to a ten-thousandth. "Sure is tough," said the one. "I wonder how many of those damn things there are to an inch." "I dunno," replied the other, "but there must be millions of 'em!"



THE PROCESS IS PROVOCATIVE—And so are the ladies. The lovely young lady on the left is not taking a chance with an egg, for the attractive young lady on the right is using a new "silent sound" ultrasonic cutting tool, made by the Sheffield Corporation, which will cut a tiny hole through the eggshell without damage to the delicate membrane beneath. The process precisely controls and converts high-speed waves of "silent sound" into cutting and machining actions on both hard metals and brittle substances

Exactly the Power You Need



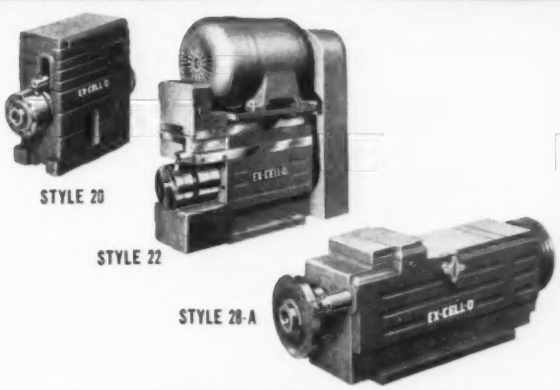
Range of horsepower, stroke, spindle speed and thrust in Ex-Cell-O Quill Type Power Units

Ex-Cell-O Hydraulic Power Units come in sizes suitable for a wide range of applications. Compact design makes it possible to place them at close center distances either in line or radially around a fixture. No matter what the application, you get smooth, dependable operation.

Used in drilling, counterboring, spot-facing and reaming operations, these hydraulic power units can be designed into special-purpose machines with easily controlled automatic cycles. Units can later be re-arranged to perform different machining operations.

You can install these power units easily. They'll stand up under fast cycles and continuous operation; they're self-lubricated.

For complete information ask your Ex-Cell-O representative or write Ex-Cell-O in Detroit.



STYLE 20

STYLE 22

STYLE 28-A

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

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56-45

News OF THE INDUSTRY

California

NORTHROP AIRCRAFT INC., Hawthorne, Calif., announces the appointments of F. W. LLOYD and G. C. CHALMERS as manager and assistant manager of manufacturing engineering, respectively. Mr. Lloyd has been with the company since 1941 and has worked in various manufacturing capacities. Mr. Chalmers has been with the company for six years.

PAUL V. O'DAFFER has been appointed district sales manager in the California area for Rockwell Mfg. Co.'s Delta Power Tool Division. Mr. O'Daffer will cover most of northern California, Nevada, Utah, and part of Wyoming.

KENNETH C. BRADLEY has been appointed lathe sales engineer for the machine tool department of the Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif.

Illinois and Missouri

ALFRED J. OLSON has been named general sales manager for the Chicago plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill. The office of sales manager, vacated by Mr. Olson, has been assumed by ROBERT A. DAGGIT and SCOTT VROOMAN who formerly held the position of assistant sales manager. Mr. Olson was a sales representative in Illinois from 1936 until 1947 when he was appointed assistant sales manager. He was made sales manager in 1954.



Alfred J. Olson, general sales manager, Chicago plant of Joseph T. Ryerson & Son, Inc.

STEWART-WARNER CORPORATION, Chicago, Ill., announces that distribution of its line of electronic industrial balancing equipment, formerly marketed by MERRILL ENGINEERING LABORATORIES, Denver, is now being handled through a special department headed by RALPH BUSCARELLO, located at the corporation's general offices in Chicago.

HANNIFIN CORPORATION, Des Plaines, Ill., has divisionalized its sales operations. Divisional sales managers are: ROBERT G. BROBERG, for the Air & Hydraulic Power Cylinder Division; WILLIAM C. THOMPSON, for the Air Valve Division; and ARNOLD W. BLACKSHAW, for the Machinery Division, air and hydraulic presses, and portable hydraulic power tools.

CRANE PACKING CO., Chicago, Ill., has completed a three-year expansion and construction program to make its manufacturing and service facilities available throughout the United States and Canada. Construction encompassed erection of four new plants and expansion of a fifth.

Thor Power Tool Co., Aurora, Ill., announces the appointment of MARTIN A. BERTRAM as Great Lakes manager for electric tool sales. It was also announced that a new branch office has been opened at 2024 Chamberlayne Ave., Richmond, Va. KENNETH V. BENNETT was named manager.

JOE MORRIS has been appointed chief engineer of Barnes Drill Co., Rockford, Ill.

MILL SUPPLY & MACHINERY CO., 2910 Washington Ave., St. Louis, Mo., has been appointed distributor for southern Illinois and eastern Missouri by the Greaves Machine Tool Co., Cincinnati, Ohio, a division of J. A. Fay & Egan Co.

Michigan

BENDIX AVIATION CORPORATION, Detroit, Mich., and SHEFFIELD CORPORATION, Dayton, Ohio, have approved a combination of the two companies. A concurrent announcement was made by LOUIS POLK, president of Sheffield, and MALCOLM P. FERGUSON, president of Bendix. Sheffield will continue to operate under its present management—retaining its corporate title—as a wholly owned subsidiary. The corporation will retain product brand names in all types of industrial precision gaging and measuring controls. It was also announced that Mr. Polk will become a director, a vice-president, and group executive of Bendix and a member of its administration committee. Sheffield headquarters, main plant, and research laboratories, including the new Eli Whitney metallurgical laboratory will remain in Dayton.

A. D. MONCRIEFF has been elected vice-president of Michigan Tool Co., Detroit, Mich. In his new capacity, Mr. Moncrieff will act as manager of the company's Machine & Tool Division comprising the Six Mile Road plant, Manistee Iron Works plant, Gear-O-Mation plant, Shear-Speed chemical products plant, and the



A. D. Moncrieff, vice-president of Michigan Tool Co.

(*continued on page 262*)

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

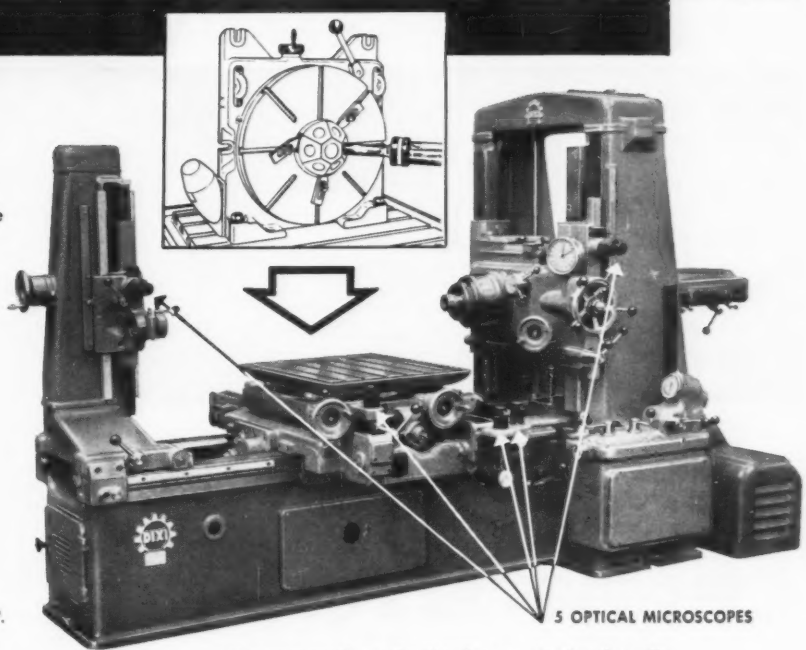
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Overall accuracy of .0002"

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝" All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



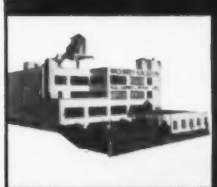
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Names available upon request.

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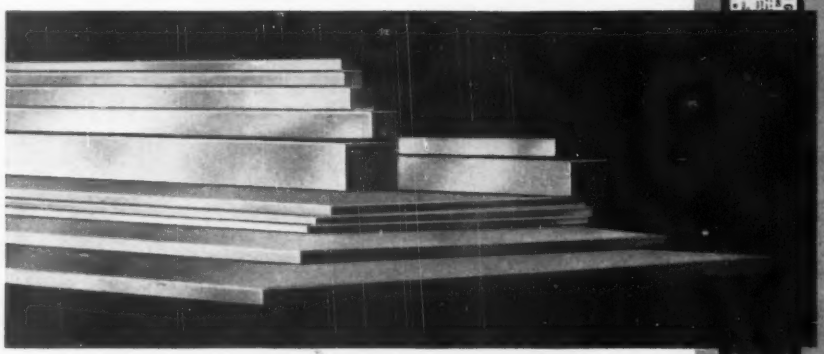
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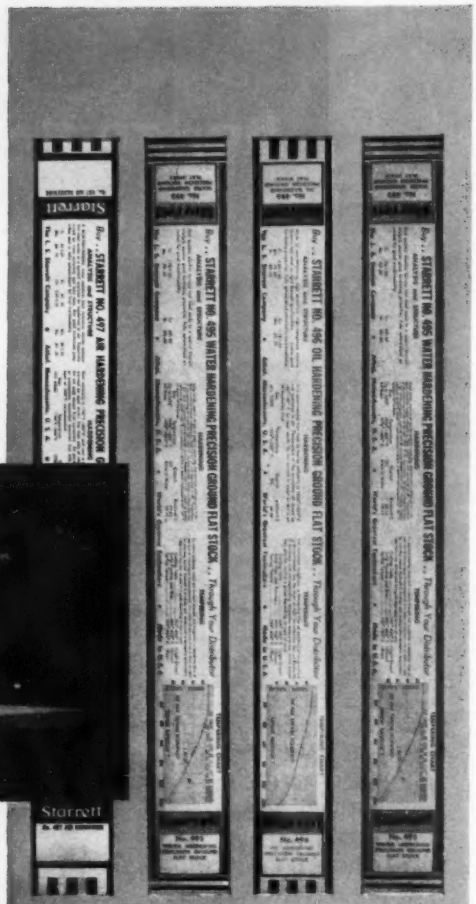
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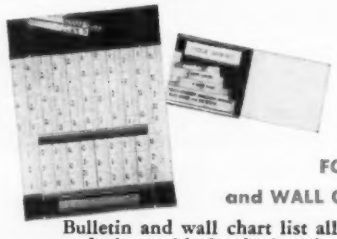
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Now it's easier than ever to save time and money by using Starrett Precision Ground Die Stock and Flat Stock. With over 1000 sizes available, you can make *all* your machine and fixture parts, special tools and gages, stamps, dies, cutters, templates this sensible, money-saving way.

Just think what it means . . . no time lost hunting up stock — no slow and costly grinding to size. Just lay it out and saw it out. Four types — air, oil, oil or water and water hardening — let you choose the hardening characteristics that fit your specific needs. Your Industrial Distributor has it. Specify *Starrett* to get the wide choice of sizes.

Flat Stock comes in 18″ lengths, Die Stock in 36″ lengths. Thicknesses from 1/64″ to 3″. Widths from 1/64″ to 14″. Each piece marked for type and size and individually packaged in protective envelope.



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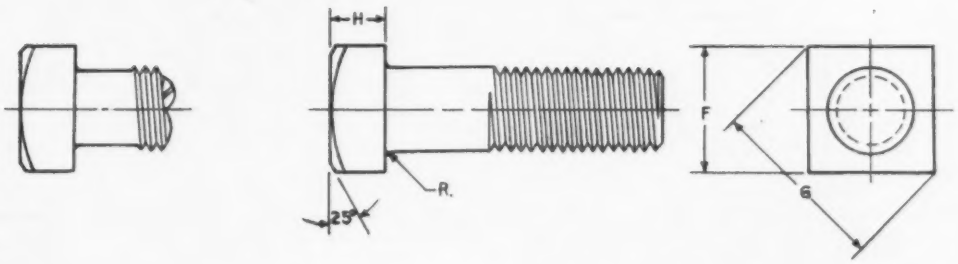
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For more information fill in page number on Inquiry Card, on page 239

AMERICAN STANDARD REGULAR SQUARE BOLTS



Nominal Size or Basic Major Diameter of Thread	Body Diam.*	Width Across Flats F		Width Across Corners G		Height H			Radius of Fillet R
	Max.	Max. (Basic)	Min.	Max.	Min.	Nom.	Max.		Max.
1/4 0.2500	0.260	3/8 0.3750	0.362	0.530	0.498	11/64	0.188	0.156	0.031
5/16 0.3125	0.324	1/2 0.5000	0.484	0.707	0.665	13/64	0.220	0.186	0.031
3/8 0.3750	0.388	9/16 0.5625	0.544	0.795	0.747	1/4	0.268	0.232	0.031
7/16 0.4375	0.452	5/8 0.6250	0.603	0.884	0.828	19/64	0.316	0.278	0.031
1/2 0.5000	0.515	3/4 0.7500	0.725	1.061	0.995	21/64	0.348	0.308	0.031
5/8 0.6250	0.642	15/16 0.9375	0.906	1.326	1.244	27/64	0.444	0.400	0.062
3/4 0.7500	0.768	1 1/8 1.1250	1.088	1.591	1.494	1/2	0.524	0.476	0.062
7/8 0.8750	0.895	1 5/16 1.3125	1.269	1.856	1.742	19/32	0.620	0.568	0.062
1 1.0000	1.022	1 1/2 1.5000	1.450	2.121	1.991	21/32	0.684	0.628	0.093
1 1/8 1.1250	1.149	1 11/16 1.6875	1.631	2.386	2.239	3/4	0.780	0.720	0.093
1 1/4 1.2500	1.277	1 7/8 1.8750	1.812	2.652	2.489	27/32	0.876	0.812	0.093
1 3/8 1.3750	1.404	2 1/16 2.0625	1.994	2.917	2.738	29/32	0.940	0.872	0.093
1 1/2 1.5000	1.531	2 1/4 2.2500	2.175	3.182	2.986	1	1.036	0.964	0.093
1 5/8 1.6250	1.658	2 7/16 2.4375	2.356	3.447	3.235	1 3/32	1.132	1.056	0.125

All dimensions given in inches.

Bolt is not finished on any surface.

Taper of head (angle between one side and axis) shall not exceed 2 degrees, specified width across flats being the largest dimension.

Top of bolt head shall be flat and chamfered. Diameter of top circle shall be maximum width across flats within a tolerance of minus 15 per cent.

Bearing surface shall be at right angle to axis of body within a tolerance of 3 degrees for 1-inch size or smaller and 2 degrees for sizes larger than 1 inch, and concentric with axis of body within a tolerance of 3 per cent of maximum width across flats.

Minimum thread length shall be twice the diameter plus 1/4 inch for lengths up to and including 6 inches and twice the diameter plus 1/2 inch for lengths over 6 inches. Bolts too short for the formula thread length shall be threaded as close to the head as practical.

Thread shall be coarse-thread series, Class 2A.

Tolerance on bolt length for bolts 6 inches and under in length shall be plus or minus 1/32 inch for sizes 1/4 to 3/8 inch; plus or minus 1/16 inch for sizes 7/16 and 1/2 inch; plus or minus 1/8 inch for sizes 5/8 inch to 1 1/4 inches; and plus or minus 1/4 inch for sizes 1 3/8 to 1 5/8 inches. Length tolerance for bolts over 6 inches in length shall be plus or minus 1/16 inch for sizes 1/4 to 3/8 inch; plus or minus 3/32 inch for sizes 7/16 and 1/2 inch; plus or minus 3/16 inch for sizes 5/8 inch to 1 1/4 inches; plus or minus 1/4 inch for sizes 1 3/8 to 1 5/8 inches.

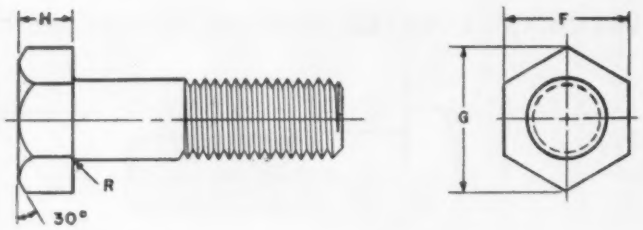
Bolts shall enter ring gage to head; ring gage shall have a maximum thickness of one diameter, a minimum fillet equal to the maximum fillet of the bolt, and an internal diameter equal to the specified maximum body diameter. When specified as "under-size body," body diameter may be reduced to approximately the thread pitch diameter. Shoulder next to head at manufacturer's option. Under-size body bolt usually stocked only up to 1/2 inch by 6 inches.

Suitable material for steel bolt is covered in Tentative Specification for Steel Machine Bolts and Nuts and Tap Bolts of the American Society for Testing Materials (ASTM designation: A-307).

* There may be a reasonable swell or fin under the head not to exceed the nominal body diameter by the following: 0.030 inch for sizes up to 1/2 inch; 0.050 inch for sizes 5/8 and 3/4 inch; 0.063 inch for sizes over 3/4 inch up to 1 1/4 inches; 0.093 inch for sizes over 1 1/4 inches up to 2 inches; 0.125 inch for sizes over 2 inches up to 3 inches; and 0.188 inch for sizes over 3 inches.

Extracted from American Standard Square and Hexagon Bolts and Nuts (ASA B18.2-1955), with the permission of the publisher, the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

AMERICAN STANDARD REGULAR HEXAGON BOLTS



Nominal Size or Basic Major Diameter of Thread		Body Diam.*	Width Across Flats F			Width Across Corners G		Height H			Radius of Fillet R
		Max.	Max. (Basic)		Min.	Max.	Min.	Nom.		Min.	Max.
1/4	0.2500	0.260	7/16	0.4375	0.425	0.505	0.484	11/64	0.188	0.150	0.031
5/16	0.3125	0.324	1/2	0.5000	0.484	0.577	0.552	7/32	0.235	0.195	0.031
3/8	0.3750	0.388	9/16	0.5625	0.544	0.650	0.620	1/4	0.268	0.226	0.031
7/16	0.4375	0.452	5/8	0.6250	0.603	0.722	0.687	19/64	0.316	0.272	0.031
1/2	0.5000	0.515	3/4	0.7500	0.725	0.866	0.826	11/32	0.364	0.302	0.031
5/8	0.6250	0.642	15/16	0.9375	0.906	1.083	1.033	27/64	0.444	0.378	0.062
3/4	0.7500	0.768	1 1/8	1.1250	1.088	1.299	1.240	1/2	0.524	0.455	0.062
7/8	0.8750	0.895	1 5/16	1.3125	1.269	1.516	1.447	37/64	0.604	0.531	0.062
1	1.0000	1.022	1 1/2	1.5000	1.450	1.732	1.653	43/64	0.700	0.591	0.093
1 1/8	1.1250	1.149	1 11/16	1.6875	1.631	1.949	1.859	3/4	0.780	0.658	0.093
1 1/4	1.2500	1.277	1 7/8	1.8750	1.812	2.165	2.066	27/32	0.876	0.749	0.093
1 3/8	1.3750	1.404	2 1/16	2.0625	1.994	2.382	2.273	29/32	0.940	0.810	0.093
1 1/2	1.5000	1.531	2 1/4	2.2500	2.175	2.598	2.480	1	1.036	0.902	0.093
1 3/4	1.7500	1.785	2 5/8	2.6250	2.538	3.031	2.893	1 5/32	1.196	1.054	0.125
2	2.0000	2.039	3	3.0000	2.900	3.464	3.306	1 11/32	1.388	1.175	0.125
2 1/4	2.2500	2.305	3 3/8	3.3750	3.262	3.897	3.719	1 1/2	1.548	1.327	0.188
2 1/2	2.5000	2.559	3 3/4	3.7500	3.625	4.330	4.133	1 21/32	1.708	1.479	0.188
2 3/4	2.7500	2.827	4 1/8	4.1250	3.988	4.763	4.546	1 13/16	1.869	1.632	0.188
3	3.0000	3.081	4 1/2	4.5000	4.350	5.196	4.959	2	2.060	1.815	0.188
3 1/4	3.2500	3.335	4 7/8	4.8750	4.712	5.629	5.372	2 3/16	2.251	1.936	0.188
3 1/2	3.5000	3.589	5 1/4	5.2500	5.075	6.062	5.786	2 5/16	2.380	2.057	0.188
3 3/4	3.7500	3.858	5 5/8	5.6250	5.437	6.495	6.198	2 1/2	2.572	2.241	0.188
4	4.0000	4.111	6	6.0000	5.800	6.928	6.612	2 11/16	2.764	2.424	0.188

All dimensions given in inches.

Bolt is not finished on any surface.

Taper of head (angle between one side and axis) shall not exceed 2 degrees, specified width across flats being the largest dimension.

Top of bolt head shall be flat and chamfered. Diameter of top circle shall be maximum width across flats within a tolerance of minus 15 per cent.

Bearing surface shall be at right angle to axis of body within a tolerance of 3 degrees for 1-inch size or smaller and 2 degrees for sizes larger than 1 inch. The bearing surface shall be concentric with axis of body within a tolerance of 3 per cent of maximum width across flats.

Minimum thread length shall be twice the diameter plus 1/4 inch for lengths up to and including 6 inches and twice the diameter plus 1/2 inch for lengths over 6 inches. Bolts too short for the formula thread length shall be threaded as close to the head as practical.

Thread shall be coarse-thread series, Class 2A.

Tolerance on bolt length for bolts 6 inches and under in length shall be plus or minus 1/32 inch for sizes 1/4 to 3/8 inch; plus or minus 1/16 inch for sizes 7/16 and 1/2 inch; plus or minus 1/8 inch for sizes 5/8 to 1 1/4 inches; and plus or minus 1/4 inch for sizes 1 3/8 to 4 inches. Length tolerance for bolts over 6 inches in length shall be plus or minus 1/16 inch for sizes 1/4 to 3/8 inch; plus or minus 3/32 inch for sizes 7/16 and 1/2 inch; plus or minus 3/16 inch for sizes 5/8 inch to 1 1/4 inches; and plus or minus 1/4 inch for sizes 1 3/8 to 4 inches.

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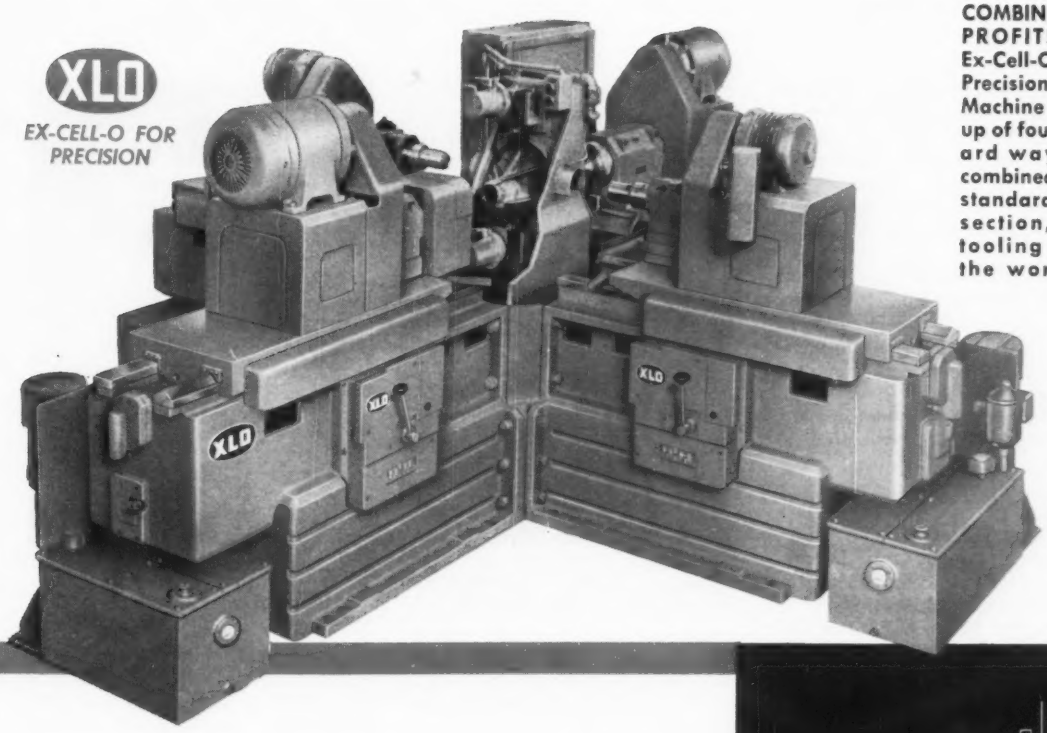
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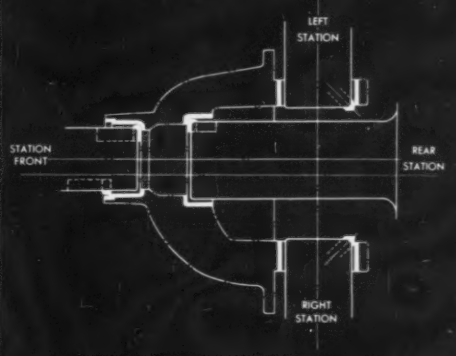
EX-CELL-O FOR PRECISION



COMBINED FOR PROFITS—this Ex-Cell-O 4-Way Precision Boring Machine is made up of four standard way units combined with a standard center section, with tooling to suit the work.

4 Holes, 90° Apart Bored Simultaneously

ON EX-CELL-O 4-WAY MACHINE



SIMULTANEOUS MACHINING of four holes assures a 90° relationship between bearing bores and pinion bores.

This differential carrier assembly requires the boring of accurate holes at right angles to one another. Bore diameters are held as close as .0005". Shoulders must be square with bores. Bearing bores must be square with pinion bores.

Here was an opportunity to combine operations by using an Ex-Cell-O 4-Way Precision Boring Machine, with these profitable results:

FASTER PRODUCTION—machine works simultaneously from four directions.

PRECISION—accurate bores, holding the 90° relationship, are produced by precision spindles, smooth, hydraulically operated slides, and accurate location of the way units.

RELOCATION ERRORS ELIMINATED—since the part is located and clamped only once, there can be no errors caused by relocating and reclamping.

Is there an opportunity to cut costs and combine operations in your product? These way-type precision boring machines, special machines composed of standard units, also are used in automated production lines. They can be placed side by side and connected with transfer type fixtures to form transfer machines, or they can be combined in a transfer machine at those stations where precision boring and similar operations are required.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

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57-3

Windsor, Ontario, affiliate of Michigan Tool. Mr. Moncrieff joined Michigan Tool in 1933, being appointed assistant chief engineer in 1943. He was appointed manufacturing manager of the Machine Tool & Cutting Tool Division in 1954.

CLAUD A. FENN, vice-president of Clark Equipment Co., Buchanan, Mich., has been appointed to a newly created position on the president's staff to coordinate manufacturing operations in all Clark Equipment plants. In his new capacity, Mr. Fenn will be responsible for all company property, buildings, equipment, and manufacturing policies and procedures.

VICKERS INCORPORATED, Detroit, Mich., announces expansion of the company's industrial electro-hydraulic servo group. R. J. RENDER has joined the group as application engineer and will be working at the company's administrative and engineering center in suburban Detroit.

EX-CELL-O CORPORATION, Detroit, Mich., announces the acquisition of two new firms, the CADILLAC GAGE Co., Roseville, Mich., and the SMITH BEARING Co., Trenton, N. J. The two firms will operate as separate units under their existing managements.

LEO B. GRANT has been appointed to the newly created position of sales manager of the Dow Chemical Co.'s chemical department in Midland, Mich. At the same time, it was announced that JAMES DAY, supervisor of chemical sales in the New York office, will succeed Mr. Grant as manager.

STEVEN S. GORDON has been appointed assistant general manager of Republic Gear Co., Detroit, Mich., a subsidiary of Gear Grinding Machine Co.

RICHARD P. COTTRELL has joined the sales administration staff of Detroit Broach & Machine Co., Rochester, Mich.

New England

SAMUEL D. CONANT has been elected vice-president in charge of sales of the Jacobs Mfg. Co., West Hartford, Conn. Mr. Conant entered the field sales organization of the Greenfield Tap & Die Corporation in 1935. He was manager of the Detroit sales district from 1943 to 1946, and after a year as New York State representative of the Putman



John Haley

Samuel D. Conant, vice-president in charge of sales of the Jacobs Mfg. Co.

Tool Co., he became associated with the Jacobs organization. In 1948, he was made sales manager of this company and was elected a director in 1952.

HEALD MACHINE CO., Worcester, Mass., has named E. BRUCE CRABTREE branch manager of its Dayton sales office and HOMER R. GEOFFRION branch manager of its Indianapolis sales office. Mr. Crabtree joined the company in 1939 and served as sales engineer in Worcester and Chicago. He has been supervisor of sales in Dayton since 1951. Mr. Geoffrion has been associated with the company for sixteen years and served as sales engineer in New York and Indianapolis territories.

NORTON CO., Worcester, Mass., announces the appointments of a field engineer and two abrasive engineers in the Detroit area. WILLIAM PETTIGREW has been named field engineer. RUSSELL J. O'NEIL and LINCOLN M. JOHNSON have both been appointed abrasive engineers covering accounts in metropolitan Detroit. At the same time, the appointment of ROLAND L. JANDRON as field engineer at the company's Los Angeles office was announced.

CONE AUTOMATIC MACHINE CO., INC., Windsor, Vt., announces acquisition of manufacturing and sales rights for the H.E.B. Pilot automatic copying lathe in the United States and Canada under licensing agreement with the French machine tool builder. The machine will be known as the Conomatic Pilot, and it will be sold through the Cone sales organization.



Willis D. Horner, vice-president in charge of sales of Allen Mfg. Co.

WILLIS D. HORNER has been elected vice-president in charge of sales and a director of the Allen Mfg. Co., Hartford, Conn. Mr. Horner has been associated with the company in various sales capacities for twenty-two years.

HERBERT W. FICHTNER has been appointed sales manager of the Atrax Co., Newington, Conn. Mr. Fichtner was formerly associated with Pratt & Whitney Aircraft as tool buyer.

HUGH V. ALLISON, president and general manager of the Allison Division, American Chain & Cable Co., Inc., Bridgeport, Conn., has also been appointed to the newly created position of general manager of Acco's Campbell Machine Division.



Hugh V. Allison, president and general manager of the Allison Division, American Chain & Cable Co., Inc.

New York

H. K. PORTER CO., INC., New York City, announces the following executive appointments: E. M. EVANS, president, has been elected chairman and CHARLES L. HOLBERT, executive vice-president, has been elected president. Prior to joining the company earlier this year, Mr. Holbert was executive vice-president of the Southern Pacific Milling Co., Ventura, Calif.

LYMAN A. BLISS has been elected president of Union Carbide Nuclear Co., a Division of Union Carbide and Carbon Corporation, New York City. Mr. Bliss succeeds KENNETH RUSH, a vice-president of Union Carbide and Carbon Corporation, who will continue to have over-all responsibility for the corporation's nuclear and international activities.

JOSEPH A. DESPRES has been appointed administrative assistant to the vice-president for engineering at Ford Instrument Co., Division of Sperry Rand Corporation, New York City.

OHIO HOIST & MFG. CO., Lisbon, Ohio, has named ABRAHAM M. GOLDSMITH 26-04 Jackson Ave., Long Island City, N. Y., sales representative for metropolitan New York.

S. T. MACKENZIE has been elected a vice-president of the Babcock & Wilcox Co. and placed in charge of the sales department of the company's Boiler Division, New York City. Mr. Mackenzie was formerly sales manager and his appointment fills the vacancy created by the retirement of W. T. MCCULLOUGH, JR.

RUSSELL BURDSALL, & WARD BOLT AND NUT CO., Port Chester, N. Y., announces two new appointments: DUKE A. GARRISON and FREDERICK E. GRAVES have been appointed to new technical sales posts as assistants to JOHN S. DAVEY, vice-president.

JAMES O. DAGUE has been appointed superintendent of the mechanical department of the Bethlehem Steel Co.'s Lackawanna, N. Y., plant. Mr. Dague, assistant superintendent since 1949, succeeds the late W. C. DANIELS.

Ohio

UNITED STATES STEEL CORPORATION's American Steel & Wire Division, Cleveland, Ohio announces the following appointments: WILLIAM H. GUTERL has been appointed assistant to the general manager of sales; and WALTER L. LONGNECKER has been named Cleveland district manager of operations.

E. W. BLISS CO., Canton, Ohio, announces the appointments of HARRY A. SKILLMAN and SAMUEL C. LONGO as sales engineers. Both men have been assigned to the company's Southern California sales office at 816 N. Hollywood Way, Burbank.

SOLAR STEEL CORPORATION, Cleveland, Ohio, announces the following appointments: DONALD J. HARTMAN has been named assistant plant manager, and ELMER FROEHLICH, JR. has been made assistant sales manager at the company's Flat Rolled Products Plant in River Rouge, Mich.

ALCO PRODUCTS, INC., Schenectady, N. Y., announces the appointment of T. I. EQUIPMENT, INC. of Cleveland as its exclusive agent for northeastern Ohio for Alcotwin finned tube heat exchangers and longitudinal fin-tube products.

TIMKEN ROLLER BEARING CO., Canton, Ohio, announces the planned construction of a two-story $500,000 metallurgical research laboratory to be located immediately south of the company's Steel and Tube Division offices.

ALFRED J. CHANDLER has been appointed sales manager of the Brush Division of the Osborn Mfg. Co., Cleveland, Ohio. Mr. Chandler joined the company in 1945.

ALBERT W. ONDIS has been appointed eastern regional manager for Brush Electronics Co., division of Clevite Corporation, Cleveland, Ohio.

Pennsylvania and Maryland

CARPENTER STEEL CO., Reading, Pa., announces the appointment of five men to executive positions: JOHN MOXON—vice-president, treasurer, and secretary—was also elected to the new office of executive vice-president. DR. CARL B. POST—vice president and technical director—was elected to the board of directors. WILLARD E. ROBERTS was elected secretary and treasurer. KINGSLEY KUNHARDT was appointed to the newly established office of chairman—finance committee. ROBERT H. MELSON was appointed controller and assistant secretary.

(This section continued on page 266)



S. T. Mackenzie, a vice-president of Babcock & Wilcox Co.





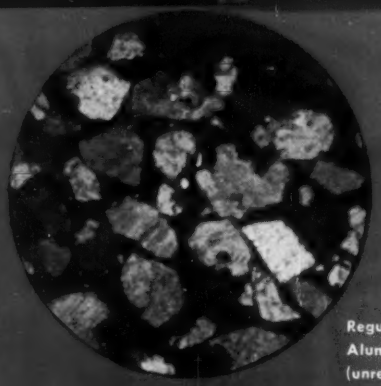
John Moxon, executive vice-president; and (right) Dr. Carl B. Post, member of the board of directors, Carpenter Steel Co.

NEW in toughness

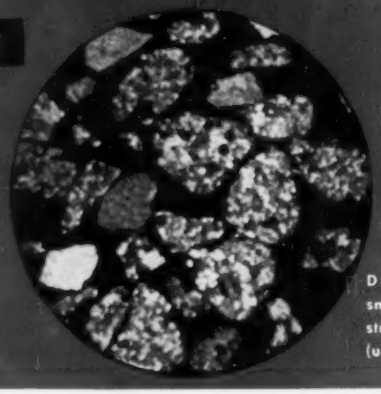
NEW in cutting action

NEW in grinding economy

NEW



Regular Aluminum Oxide (unretouched)



D A Borolon smaller crystal structure (unretouched)

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DA Borolon®

TRADE MARK



for resinoid bonded snagging wheels

A big forward step to new efficiency in grinding steel mill billets and foundry castings. Note the smaller crystalline structure of DA Borolon within each abrasive cutting particle! This means inherent toughness to resist fracture during grinding stress . . . more and sharper cutting edges on the wheel face . . . longer, useful wheel life . . . and more production per wheel dollar. Test after test on swing frames, floor stands and portables prove that Simonds wheels with this new aluminum oxide abrasive belong on your grinders for more production at lower cost. Write for descriptive bulletin.

NEW LIFE

for more grinding . . .

SIMONDS ABRASIVE CO.

GRINDING WHEELS

with DA Borolon® TRADE MARK



CALL YOUR SIMONDS DISTRIBUTOR

LOCAL STOCK FAST SERVICE

SIMONDS ABRASIVE COMPANY

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DIVISION OF SIMONDS SAW AND STEEL CO.

BRANCHES: PHILADELPHIA, CHICAGO, DETROIT, LOS ANGELES, SAN FRANCISCO, PORTLAND, ORE.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., announces the election of CARL B. POLLOCK—vice-president of operations—as vice-president in charge of manufacturing, planning, and policy. The corporation also announces the election of three new vice-presidents: MERLE J. GRAHAM, vice-president in charge of production; DR. RUSH A. LINCOLN, vice-president and technical director; and JOHN E. GROVES, vice-president—industrial relations.

B. CLARK BOECKELER has been appointed assistant for advanced planning and development for Kennametal, Inc., Latrobe, Pa. Prior to joining Kennametal, Mr. Boeckeler was president of Taylor Tubes, Inc., Chicago, and was associated for some years with Chemprotin Products Co., Trenton, Mich.

The Spring Division of CRUCIBLE STEEL COMPANY OF AMERICA has moved its sales headquarters to Pittsburgh, Pa., from New York City. Concurrently, the appointments of W. K. KREPPS as assistant to the general manager and RICHARD C. LAWSON as sales manager of the division were announced.

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh, Pa., and ROTARY ELECTRIC STEEL CO., Detroit, Mich., announce that an agreement has been reached by the respective boards of directors for the acquisition of the Rotary concern by Jones & Laughlin.

VICTOR F. STINE has been elected president of Pangborn Corporation, Hagerstown, Md. Mr. Stine has been with the company for forty-five years, starting as a bookkeeper and progressing through diversified activities until 1935 when he became second vice-president and sales manager. It was also announced that RALPH M. TRENT will assume the duties of a director and executive vice-president, and W. O. VEDDER was elected as a vice-president. THOMAS W. PANGBORN, founder and president of the corporation since 1904, will continue to serve as chairman of the board of directors, while JOHN C. PANGBORN, formerly first vice-president, will fill the office of vice-chairman of the board.



Victor F. Stine, new president of the Pangborn Corporation

Obituaries

J. HEBER PARKER, chairman of the board of directors of the Carpenter Steel Co., Reading, Pa., died recently at the age of seventy-five years. His death ended fifty-two years of service in the steel industry, all of them spent with Carpenter. He started to work for the company in 1905 in the crucible melting department. He became assistant superintendent in 1907, chief metallurgist in 1910, vice-president in 1916, president in 1941, and chairman of the board of directors in 1948. Mr. Parker was instrumental in promoting many Carpenter developments in free-machining stainless steels and other new alloy steel products.

NEWMAN M. MARSILIUS, SR., chairman of the board of the Producto Machine Co., Bridgeport, Conn., died on October 17 at the age of 66 years. As president of the company from 1928 until 1949 and then chairman up to the time of his death Mr. Marsilius built the firm into a nationally known concern. Mr. Marsilius was granted fifty patents on machine tools and allied mechanical devices. He also served as a director of the following companies: Woodstock Metal Products, Federal Machinery Sales Co., and Acme Shear Co.

ROBERT O. KNUDSON, assistant sales manager of the special machine tool department of Greenlee Bros. & Co., Rockford, Ill., died recently at the age of sixty-five years. He had been an employe of the company for thirty-four years, originally in the engineering department. Mr. Knudson is survived by his wife, two sisters, a brother, two daughters, two sons, and thirteen grandchildren.

Coming Events

MARCH 11-15—NUCLEAR CONGRESS to be held at the Convention Hall, Philadelphia, Pa., under the coordination of the Engineers Joint Council. Peacetime uses of atomic energy will be the topic of this Congress. Further information can be had from the Engineers Joint Council, 29 W. 39th St., New York 18, N. Y.

MARCH 11-15—International Atomic Exposition in conjunction with the 1957 Nuclear Congress to be held in the Philadelphia Convention Hall. Foreign firms and governments wishing to participate may get complete information from the nearest United States consulate or legation, or direct from the Exposition Offices, International Atomic Exposition, Inc., 304 Architects Building, Philadelphia, Pa.

MARCH 25-27—Silver Anniversary, Technical Meeting, and Convention of the AMERICAN SOCIETY OF TOOL ENGINEERS at the Shamrock Hilton Hotel, Houston, Tex., will include symposiums on ceramic and plastic tooling, technical papers, and panels. Program Director L. S. Fletcher, 10700 Puritan Ave., Detroit 38, Mich.

MARCH 25-29—Tenth Western Metal Exposition and Congress, sponsored by the AMERICAN SOCIETY FOR METALS and other technical groups to be held at the Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. Managing Director W. H. Eisenman, 7301 Euclid Ave., Cleveland, Ohio.

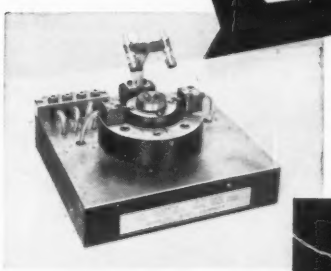
APRIL 9-11—Fifth Welding Show and Industrial Exposition sponsored by the AMERICAN WELDING SOCIETY to be held at Convention Hall, Philadelphia, Pa. Advance registration tickets and hotel information may be obtained from Robert T. Kenworthy, exposition management, 12 E. 41st St., New York 17, N. Y.

MAY 1-3—ELECTRONIC COMPONENTS SYMPOSIUM co-sponsored by four leading electronic organizations, to be held at the Morrison Hotel, Chicago, Ill. This meeting also has the active participation of agencies of the Department of Defense and the National Bureau of Standards. Information can be obtained from J. S. Powers, Electronic Components Symposium, 84 E. Randolph St., Chicago 1, Ill.

Speed Inspection
OF PRODUCTION PARTS!

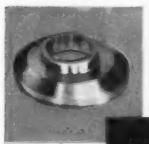


NEW DEARBORNAIRE
MULTIPLE COLUMN AIR GAGING INSTRUMENTS

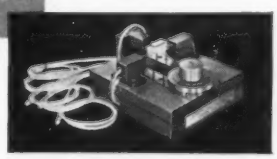




Special Air Gaging Fixtures designed and built to meet your particular application requirements. Complete engineering service available upon request.



Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.



To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced . . .

- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
- New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
- Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
- Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.

Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!

AIR GAGE DIVISION
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For more information fill in page number on Inquiry Card, on page 239

$25,000 Machine Design Award Program

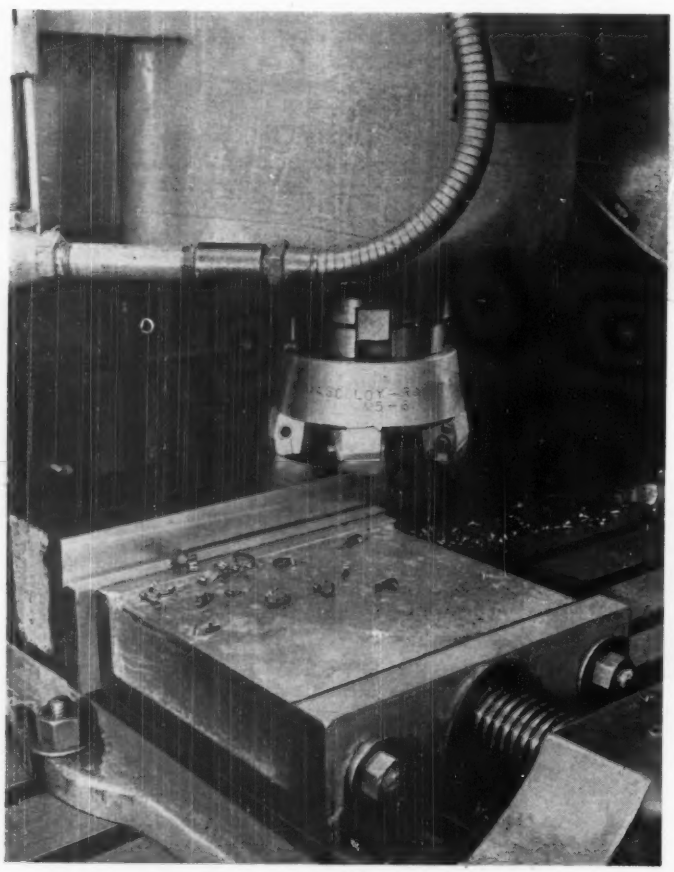
A competition among machine designers for the best paper on the use of arc welding to improve the fabrication of industrial equipment has been announced by the James F. Lincoln Arc Welding Foundation. Awards totaling $25,000 have been offered. Prizes range from $4000 for the first grand award to $1500 for the fifth. The nine papers that receive one of the three awards in each of the three divisions of the program will be considered for the grand awards. The divisional awards range from $1000 for first to $600 for third. Twelve honorable mention awards of $400 will be granted.

Equipment used in construction, mining, and certain processing industries are to be included as subject matter for the competition as well as jigs, fixtures, and tooling for all industries. The competition closes July 15, 1957. Residents of the United States and its possessions may enter. Rules and conditions are given in booklet form available from the James F. Lincoln Arc Welding Foundation, P.O. Box 3035, Cleveland 17, Ohio.

Throw-Away Carbide Bits Prove Economical at Convair

Milling cutters provided with throw-away carbide tool bits are used in the shops of Convair, a Division of General Dynamics Corporation, San Diego, Calif., on a variety of operations. In the illustration, the milling cutter is provided with five Vascoloy-Ramet throw-away bits. Each of these bits has eight cutting edges. As an edge becomes dull on any bit, a new edge is positioned in the proper cutting relation to the work. When all edges have become dull, the bit is discarded. This practice has proved more economical than to regrind bits.

Milling cutters of this type are being used on both steel and aluminum. In the illustration, SAE 4130 steel is being milled at a surface speed of 270 feet per minute and at a feed of 0.006 inch. The depth of cut is 1/4 inch.



Milling operation being performed with a cutter-head equipped with throw-away carbide bits

• • •

Bearing and Lubricant Development Center

A test and development center for research on bearings and lubricants has been opened by the General Electric Co. at Schenectady, N. Y. Said to be the largest of its kind in American industry, this new facility cost $1,000,000 to build and will be used to conduct engineering research programs. Engineers and scientists in this activity will be concerned with all types of bearings and with problems in closely related fields. Lubrication work will include investigation and development of oils, greases, synthetic lubricants, and solid lubricants. In addition, the center will supply consulting service and assist in setting standards and specifications for the company.

• • •

License Available for Non-Distorting Work-Holder

A patent for the "Helimatic" chuck described on pages 175 and 176 of the May, 1956, number of MACHINERY has been granted to Helimatic, P. O. Box 159, Melrose Park, Ill. Shop-right licenses or arrangements for the purchase of such non-distorting work-holders on a royalty basis can be made through this company.

• • •

Film on Principles of Optical Tooling

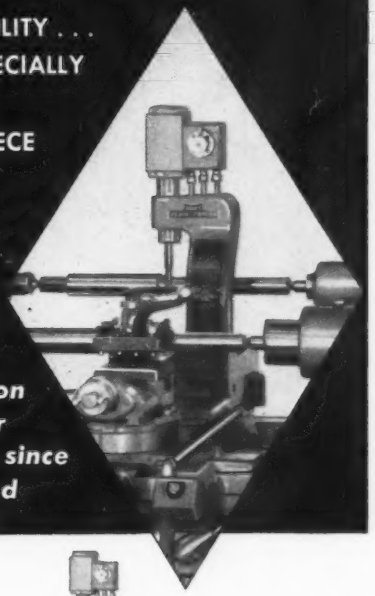
A 16-millimeter color-sound film entitled "Optical Tooling" is available on free loan to industrial firms, engineering associations, and educational institutions. The film illustrates, by means of animated drawings and working models, the principles of optical tooling along with some of the general applications of the method. Requests for the film should be addressed to the Sales Planning Department, Charles Bruning Co., 4700 Montrose Ave., Chicago 41, Ill.

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IN SIMPLICITY . . . VERSATILITY . . .
PRECISION-ACCURACY . . . ESPECIALLY
IN SAVINGS IN COST
PER FINISHED PIECE

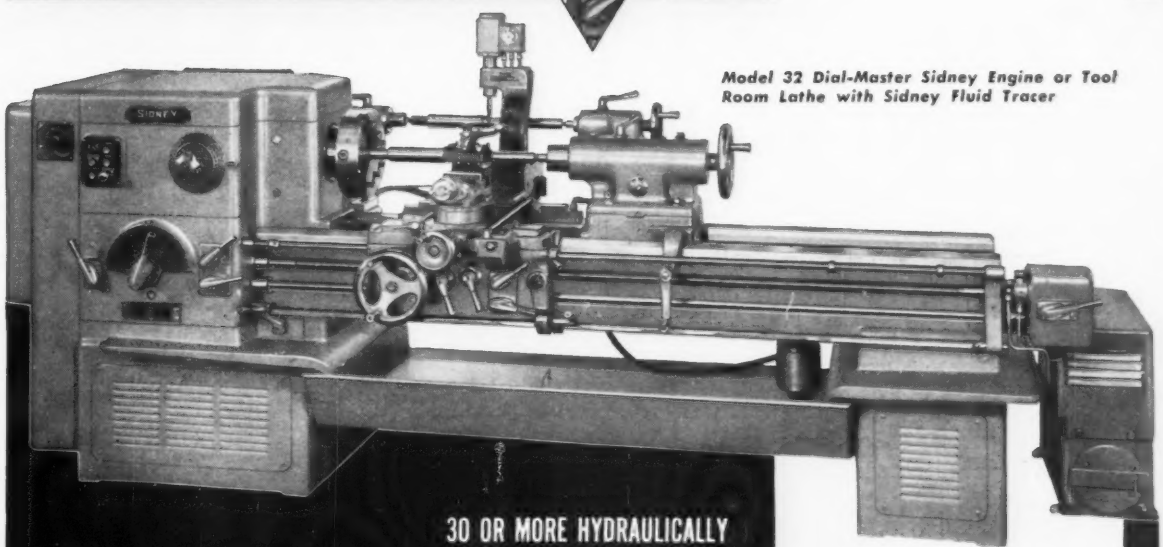
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FLUID TRACER

The finest precision duplicating attachment ever offered to industry since cutting tools were invented



INSTANTLY . . . precisely and in any desired quantity (no matter how small or extended a run) every change in contour is transferred from master piece or template to the cutting tool. It also controls the hydraulically actuated cross feed and the longitudinal movement of the carriage.

Changeover to standard lathe operation or back to tracer work requires only a few seconds without the addition or removal of any parts.



Model 32 Dial-Master Sidney Engine or Tool Room Lathe with Sidney Fluid Tracer



30 OR MORE HYDRAULICALLY CONTROLLED PRE-SELECTIVE SPINDLE SPEEDS

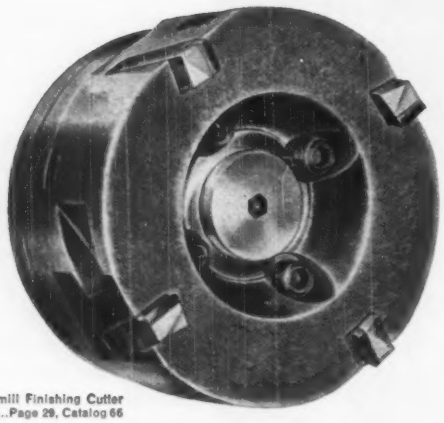
A revolutionary innovation and presented as a "SIDNEY FIRST" as long ago as the Machine Tool Show of 1947 . . . used regularly as a standard SIDNEY feature ever since. But only recently adapted by other lathe manufacturers . . . a fitting tribute to SIDNEY pioneering and leadership.

THE SIDNEY FLUID TRACER is remarkable! It saves time and costs and increases production.

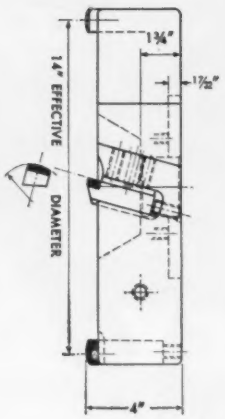
Write for bulletin or ask for representative to call at your convenience.

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904



Ingersoll Micromill Finishing Cutter
28800MM Series...Page 29, Catalog 66



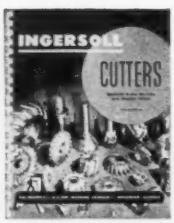
25 Micro Inch Steam-Tight Finish at Westinghouse with this INGERSOLL MILLING CUTTER

Where finish is important, look to Ingersoll for the answer. There is an Ingersoll cutter to meet virtually every finish requirement. For example, the cutter shown above is being used by Westinghouse, Steam Division, in finish milling high pressure turbine cases.

The cutters used for this work were developed by Ingersoll's research department and proved on Ingersoll's testing floor.

An Ingersoll Cutter Division representative will be glad to discuss this and other finish milling experiences with you.

Whether you are concerned with cutter costs, feed rates, longer tool life, or finish, the new Ingersoll cutter catalog will be a valuable guide. Write for your copy today, address Dept. 66B.



Use this new 82 page guide for selecting the right inserted blade milling and boring cutters for your work. Write for catalog #66, today.

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For more information fill in page number on Inquiry Card, on page 239

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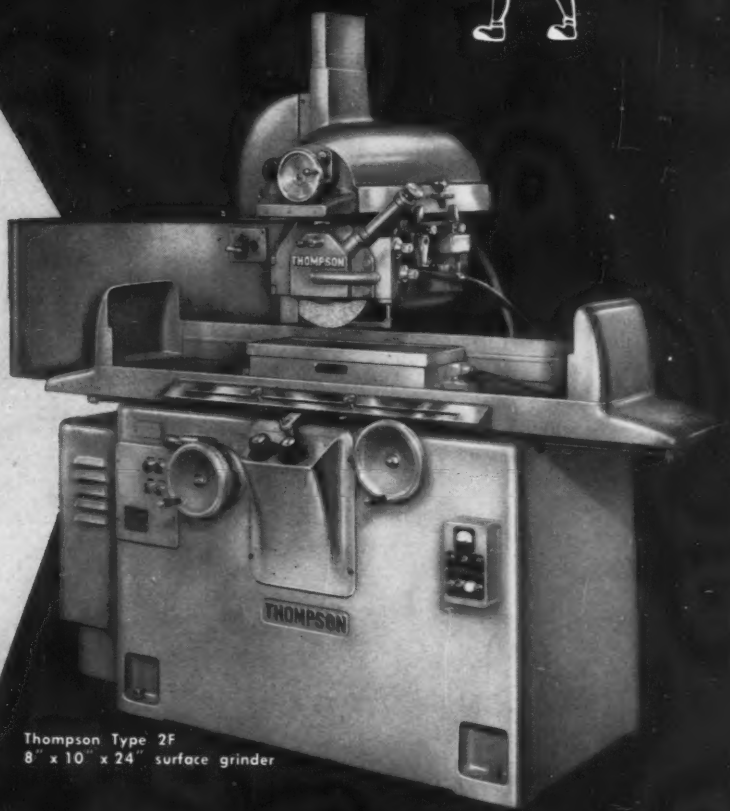
Only Thompson Type 2F Grinder has all three available . . .



1 COOLANT THRU THE WHEEL . . .

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Thompson Type 2F
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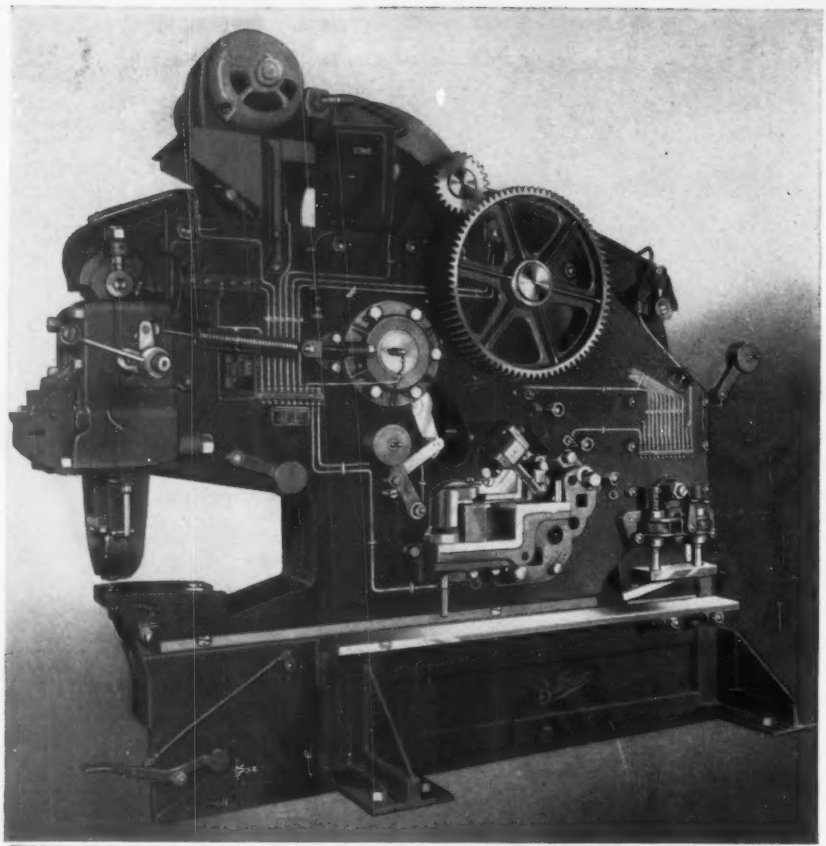
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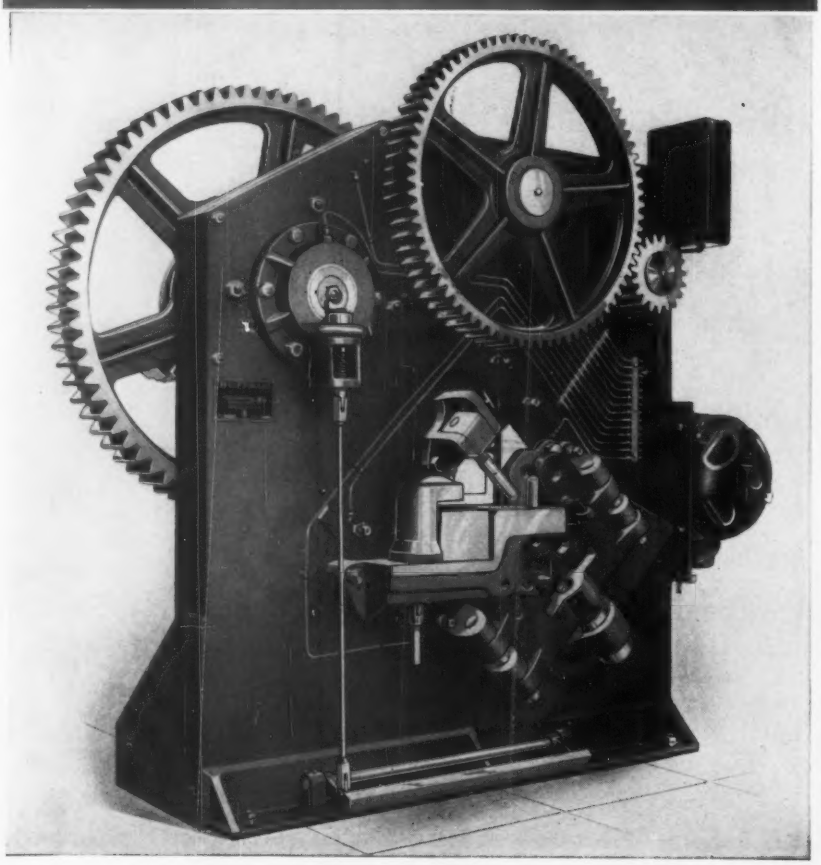
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HELPING TO

"BUFFALO" IRON WORKERS

These powerful, multi-purpose Universal Diagonal machines shown at upper left punch flanges and webs of I-Beams, channels, girders, Bethlehem Beams and H-sections. They notch angles, tees, beams, channels and plates — shear plates, flats and angles — cut rounds, squares, angles at 45° and 90°, and tees. They have the versatility of the popular Universal Iron Workers, plus large capacity — for example, the No. 4½ U.D. Machine shown, has 1 9/16" x 1¼" or 1⅜" x 1⅜" punch capacity and will shear 1¼" plates thru center. It's built up to the job, too, with its welded steel plate box frame, heavy shafts, bearings, bolsters and plungers, plus centralized oiling system. Write for Bulletin 360-G for full capacities and details.



"BUFFALO" DIAGONAL BAR CUTTERS

— like this No. 9 model at left, are easy to set up, fast-cutting and trouble-free. Large knife openings permit wide flexibility of knife combinations for minimum tool changing. 6 sizes, to handle rounds, squares, angles, tees, flats, beams or channels at speeds between 18 and 30 strokes per minute. Largest size cuts 4½" rounds or 4" squares. Also available in diagonal and special models. Write for Bulletin 3295-C, which also describes "Buffalo" Billet Shears.

"BUFFALO" BENDING ROLLS

Heavy industry uses "Buffalo" Bending Rolls like this big No. 2 Horizontal model illustrated on facing page to produce arcs, circles and spirals from heavy sections at profitable speeds. No tooling is required — rolls are quickly changed and adjusted to handle angles, tees, beams, channels, flats, tubes and pipes at the desired radius. All work is bent cold, and commercially accurate curves are easily obtained. Write for Bulletin 352-C.

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"BUFFALO" HEAVY MACHINE TOOLS are giving a powerful helping hand to builders of many of the juggernauts tackling our unprecedented highway construction programs. These "Buffalo" machines are meeting the call for "full speed ahead" with accurate, high-speed fabrication of the heavy parts and structural members needed for these highway-building giants. They perform punching, shearing, slitting, bending and other operations on punishing schedules. "Buffalo" Drilling Machines in a wide range of types and sizes, handle almost any manufacturing drill requirement.

Shown here are just three of the many "Buffalo" metalworking machines to cut time and costs in *your* plant.

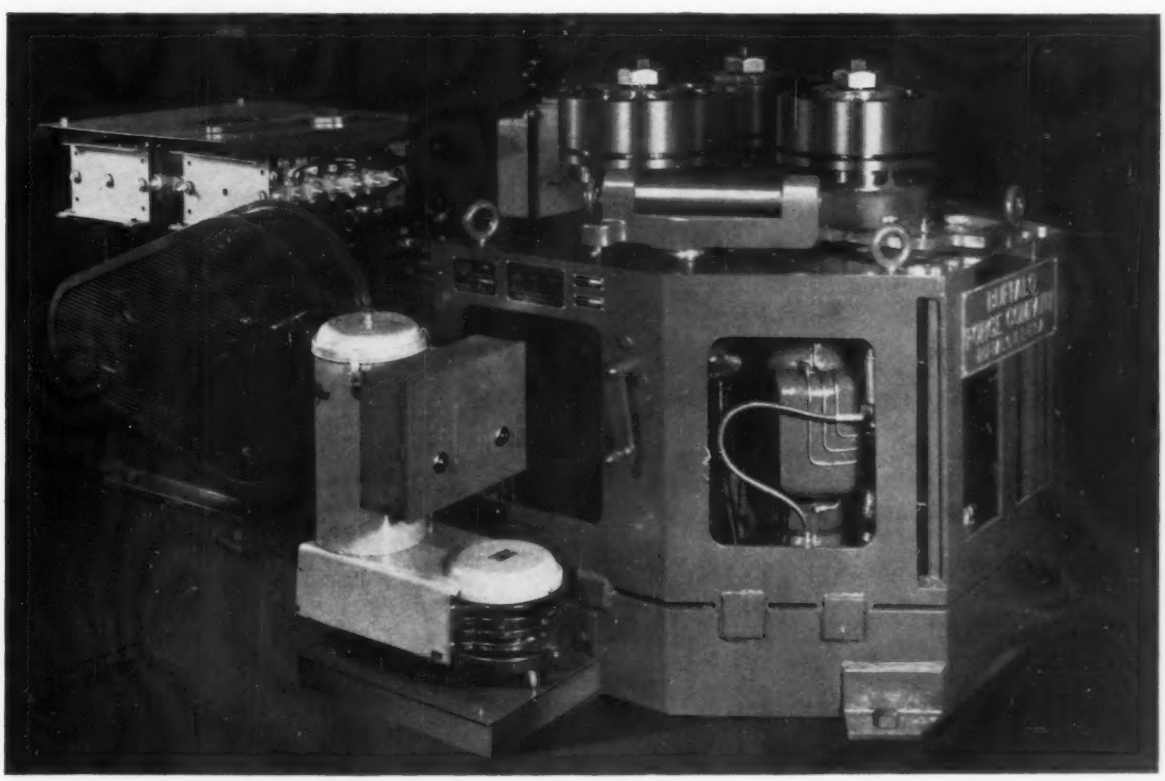
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BUFFALO FORGE COMPANY

440 Broadway • Buffalo, N. Y.

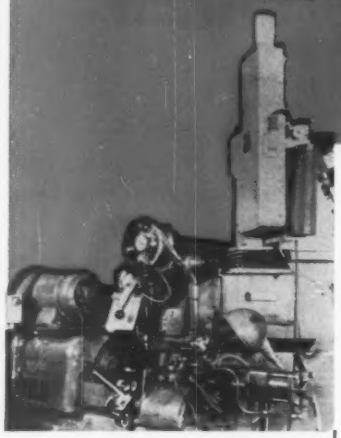
Canadian Blower and Forge Co., Ltd., Kitchener, Ont.

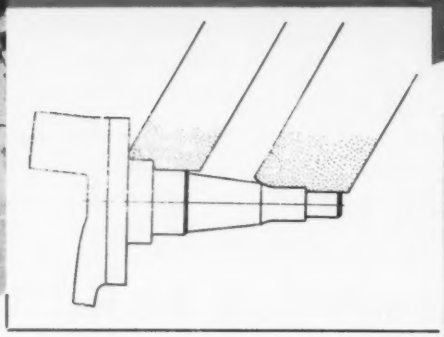
DRILLING PUNCHING SHEARING BENDING

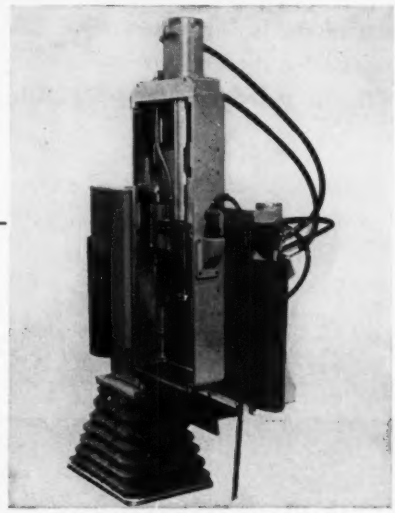


GRINDING WHEEL PROFILES never before possible

ON CYLINDRICAL GRINDERS







with the new

HOGLUND

Model 86

CONTOUR WHEEL DRESSER

THE DRESSER WITH ENLARGED SYNCHRONIZED TEMPLATES

Now, with the Model 86, any complex contour can be formed on the grinding wheel, limited only by the size and shape of the Diamond. If the Diamond can enter into the profile, the profile can be dressed —in fact, any contour desired can be continuously and accurately dressed in one automatic cycle! Instead of single template bars, Model 86 uses a pair of enlarged synchronized templates to obtain the most complex contours. Model 86 insures absolutely UNIFORM peripheral contour movements—giving profiles heretofore considered impossible on Cylindrical grinders. Here is perfect contour grinding accuracy through correct dressing of abrasive wheels, the HOGLUND way of practically eliminating skill in production contour grinding.....

Check these features of HOGLUND CONTOUR WHEEL DRESSERS

Precision

Automaticity

Will dress any angle on the grinding wheel, perpendicular as well as horizontal.

Not limited to shallow angles and profiles but will dress any angle up to perpendicular to the grinding spindle can even undercut grinding wheels, if necessary).

Eliminates necessity of skill in contour grinding.

Set up time negligible. No skill required.

Diamonds optically set in Microscope. No adjustment required on machine when changing diamonds, so repetition within a tenth is possible.

Uniform peripheral dressing speed of diamond.

HOGLUND FOR ACCURACY

HOGLUND

341 Snyder Ave., Berkeley Heights, N. J.

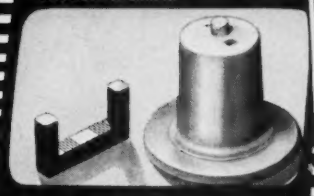
ENGINEERING & MANUFACTURING CO.

Nothing is too HARD to be Machined by

Sheffield's CAVITRON



Carbide blanking die and the Cavitron tool used to sink it.



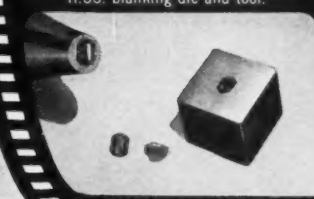
Ferrite yoke slotted after sintering and glazed porcelain in which three round and one square cavities were sunk.



H.SS. lockwasher die blank, die and the tool which produced it.



H.SS. blanking die and tool.



Carbide signet ring coining die with finished ring and Cavitron tool.

Cavitron is an ultrasonic tool by which even the hardest materials are machined readily, accurately and economically. And without regard for their electrical characteristics.

Because no heat is generated by the machining process no change is produced in physical properties of the material machined.

Cavitron is designed and built by the Sheffield Corporation which has been manufacturing precision tools for 50 years. In Cavitron you get the accuracy, rigidity and ease of control characteristic of the highest American Standards.

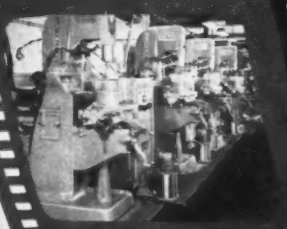
MACHINABLE MATERIALS	MACHINING OPERATIONS	PRODUCTS PRODUCED
Hardened tool steel	Drilling—boring	Dies, steel and carbide
Cemented carbides	Contouring—Engraving	Machine and motor elements
Ferrite—Germanium	Slicing and dicing	Electrical and electronic components
Cermets—ceramics—glass	Tapping	Jewell bearings—tools
Aluminum oxide		Tire molds—carbide inserts
Precious stones—quartz		



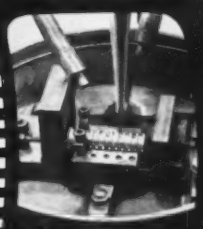
Group of parts machined by Cavitron.

Have a Sheffield engineer show you in your own office the recent sound-slide film "Machining the Unmachinable." Here is Cavitron in operation. Write to Div. 9 —*THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.*

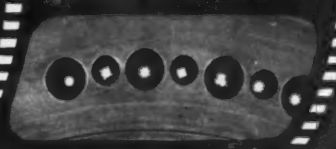
7224



Group of Cavitron machines in assembly.



Sinking diamond shaped ports in a servo valve sleeve.

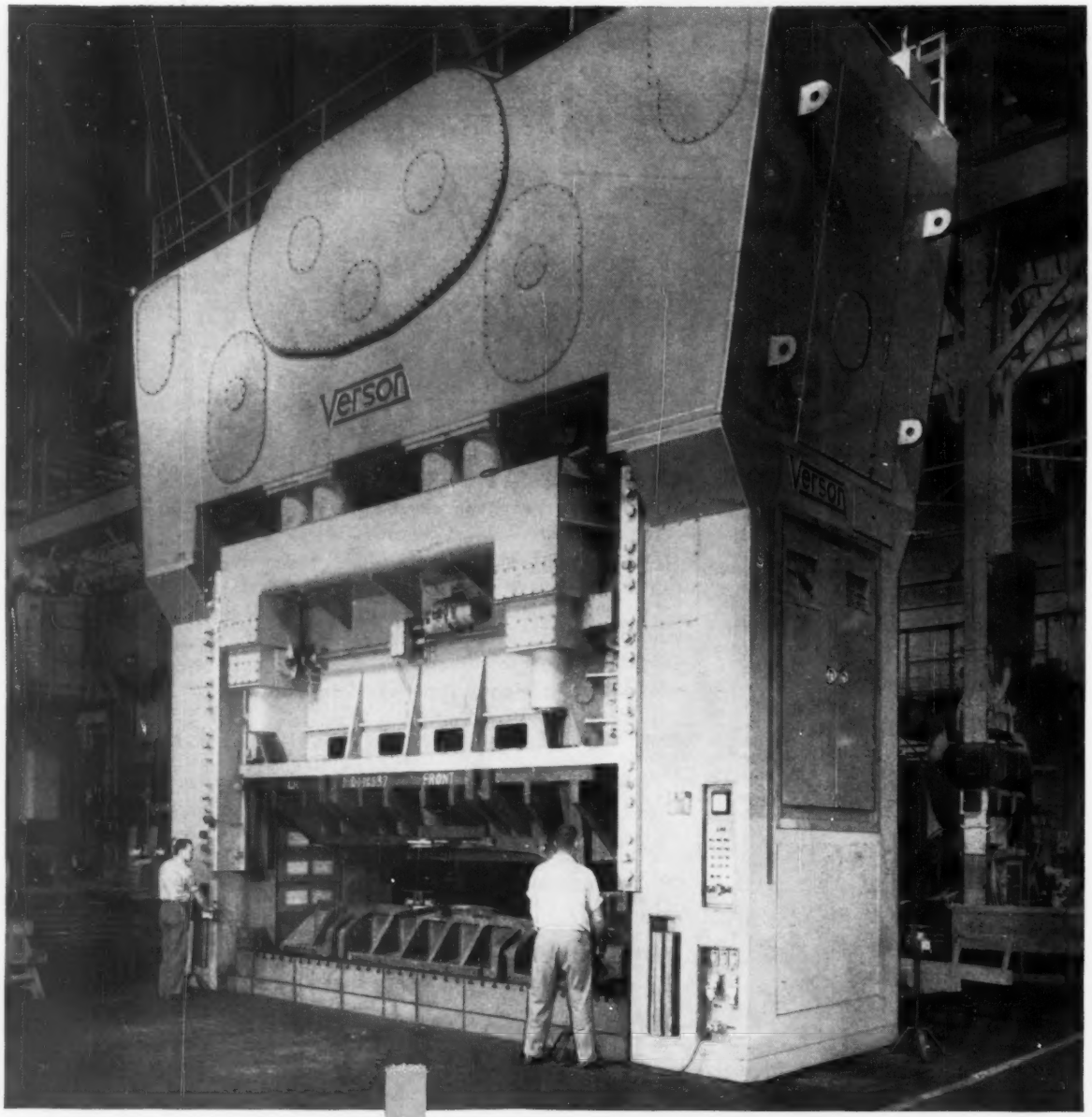


Cavitron cuts holes of varying shape in a plastic extrusion die.

MASTER CRAFTSMAN GOLDEN ANNIVERSARY HEADQUARTERS

SHEFFIELD

manufacture and measurement for mankind



WORLD'S LARGEST Mechanical Double Action Press by

Verson

The huge press illustrated above marks a milestone in press development . . . the largest mechanical double action press in the world.

Vital Statistics—Rated capacity is 2500 tons. Weight is in excess of 1,000,000 pounds. Height is in excess of 38 feet. Bed and ram measure 90″ (F-B) x 208″ (R-L). The press operates at seven strokes per minute.

Just another big press? No, but this unique press *is* just another example of Verson's advanced concepts of press design and engineering. Whatever your press requirements, these concepts assure you of more press for your money...more profitable production in your plant. For specific recommendations, send an outline of your requirements.

VERSON ALLSTEEL PRESS CO.

9309 S. Kenwood Ave., Chicago 19, Illinois • 8300 S. Central Expressway, Dallas, Texas
MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TOOLING •
CUSHIONS • VERSON-WHEELON DIRECT ACTING HYDRAULIC PRESSES

For more information fill in page number on Inquiry Card, on page 239



Jacobs
CHUCKS

Dependability is the sum of dependable parts.

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

The Jacobs Manufacturing Company
West Hartford, Connecticut



The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.

The Jacobs Rubber-Flex® Tap Chuck designed for tapping heads and impact tools.

The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.

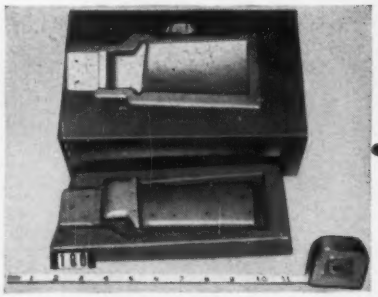
The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig-borers.

The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.

VANADIUM ALLOYS STEEL COMPANY

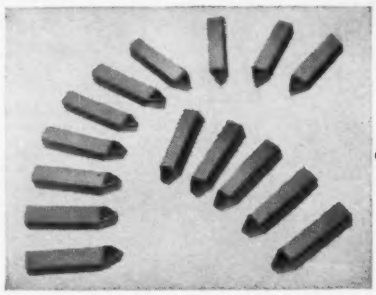
FORGING DIE

Material: Heppenstall 'A'
Conventional Machining
Time: 40 hours
Elox Setup & Machining
Time: 8 hours
Saved: 32 hours
Machine tool: Elox Standard M-500
Electrode: Cast Elo-met #3
Customers report 75% time saving in re-working dies after washout . . . no annealing is necessary.



TUNGSTEN CARBIDE SINGLE POINT TOOLS

E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to ± .001". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



EMBOSSING DIE

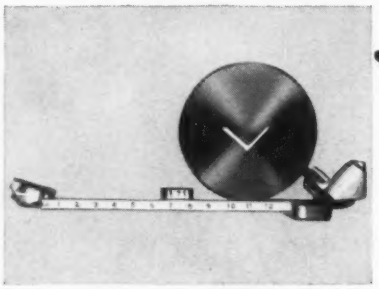
Material: Air Hardened Tool Steel
Die consists of 1,250 squares machined .100" x .030" deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining
Time: 227 hours
Elox Setup & Machining
Time: 10 hours
Saved: 217 hours
Machine Tool: Elox Standard M-500
Electrode: Free machining brass



EXTRUSION DIE

Material: Air Hardened Tool Steel
Conventional
Machining Time: 4 hours
Elox Setup &
Machining Time: 1 hr. 38 min.
Saved: 2 Hrs. 22 min.
Machine Tool: Elox Standard M-500
Electrode: Free machining brass
Machining is done after final heat treating . . . eliminating the possibility of distortion.



FROM THE HEART OF EDM



. . . 4 jobs that prove Elox puts you ahead of competition

These jobs were done for Elox customers in our "Prove It" Division. There's more to them than just "man hours" saved. The Elox sales engineer in your area would like to give you all the details about these and other applications of Electrical Discharge Machining. Why not write . . .

elox corporation of michigan *T. M. Reg.

1833 N. Stephenson Highway
Royal Oak 3, Michigan

For more information fill in page number on Inquiry Card, on page 239

VANADIUM-ALLOYS STEEL COMPANY

Presenting



an improved tungsten

Die Steel for Hot Work

with these definite superiorities:

- High resistance to thermal fatigue
- Longer die life on extrusion dies
- Outperforms standard 9.50% tungsten steels on many applications

WCC—the new tungsten, chromium, cobalt and vanadium hot work die steel—offers higher physical properties at elevated temperatures than standard 9.50% tungsten grades, and is distinguished by greater resistance to heat checking. Its cobalt content steps up hot hardness and tensile strength at high temperatures. Its vanadium content also aids hot hardness and definitely increases resistance to wear and thermal fatigue. • You'll find WCC delivers measurably better performance on a host of jobs where 9.50% tungsten had been considered standard for years . . . just specify this *modern* hot work die steel on that next job coming up!

Write for the new WCC Data Sheet—facts and figures you can use!

Vanadium-Alloys Steel Company

Latrobe, Pennsylvania

SUBSIDIARIES: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni

NOW Flame hardened bed ways ... STANDARD EQUIPMENT at NO EXTRA COST!



6319 ILLUSTRATED, 1" COLLET CAPACITY. AVAILABLE WITH VARIABLE SPEED DRIVE.

ON ALL MODELS OF

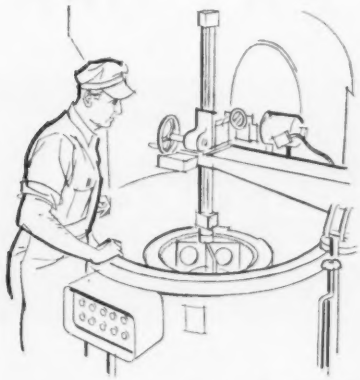
CLAUSING 12" LATHES

With the introduction of flame hardened bed ways as standard equipment at *no extra cost*, another important exclusive feature has been added to the long list of *Plus Values* that make the Clausing 12" Lathes outstanding in their price field. Write for illustrated literature, and also literature on the new variable speed drive and 12" Hydraulic Tracer Lathe.

Atlas CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY KALAMAZOO, MICHIGAN U.S.A.

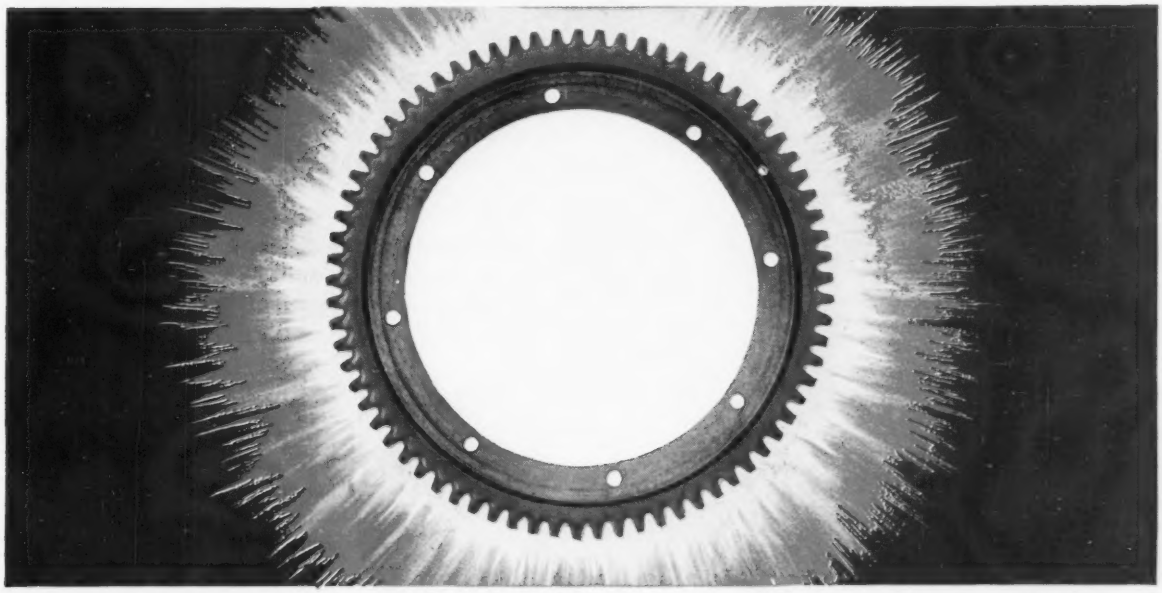
CLAUSING DIVISION ATLAS PRESS COMPANY

2-108 N. PITCHER ST., KALAMAZOO, MICHIGAN



IH Saves $82,507 Per Year

with TOCCO Induction Hardening*



Gears, shafts, pins, wheels, tubes and bars—almost any size or shape of part—or any metal, too—is adaptable to TOCCO hardening, brazing, annealing or heating for forging.

Production Up—Engineers at the Milwaukee Works of International Harvester Company have adopted TOCCO for hardening final drive gears for famous International Harvester farm tractors. TOCCO increases production on the gear shown here from 14 to 35 per hour, 250% faster than conventional heating method, reduces job from a 3 shift to 2 shift operation, even with increased production schedule. Heating time is 35 seconds; oil quench, 60 seconds.

Costs Down—TOCCO cuts cost—saves $82,507 per year on application shown above. TOCCO makes possible use of C-1050 A.R.R. steel instead of expensive A-8645-H alloy steel previously required. TOCCO also eliminates shot-blast, formerly needed to remove scale, and extra machining operations that used to be necessary to compensate for distortion.

Gear shown is 18½" O.D., width of face is 2", weight 34 pounds, 73 teeth. Hardness obtained is 55-66 R.C., using 140 K.W. of 10,000 cycle power.

Our Engineers can probably find applications in your plant where TOCCO can increase output and reduce unit costs.



THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today—NEW FREE Bulletin

The Ohio Crankshaft Co. • Dept. M-2, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name_____

Position_____

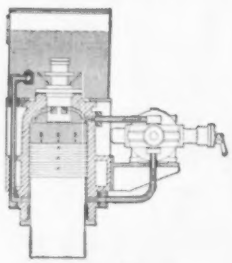
Company_____

Address_____

City_____ Zone____ State_____

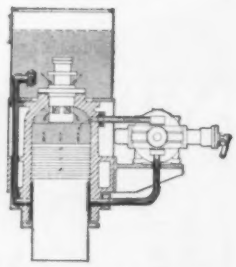
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HERE'S WHY H-P-Ms PAY OFF



Fastraverse Ram Advance

is controlled by rate pump; withdraws oil from supporting area. FASTRAVERSE prefill system augments oil to main cylinder from overhead reservoir during advance stroke.



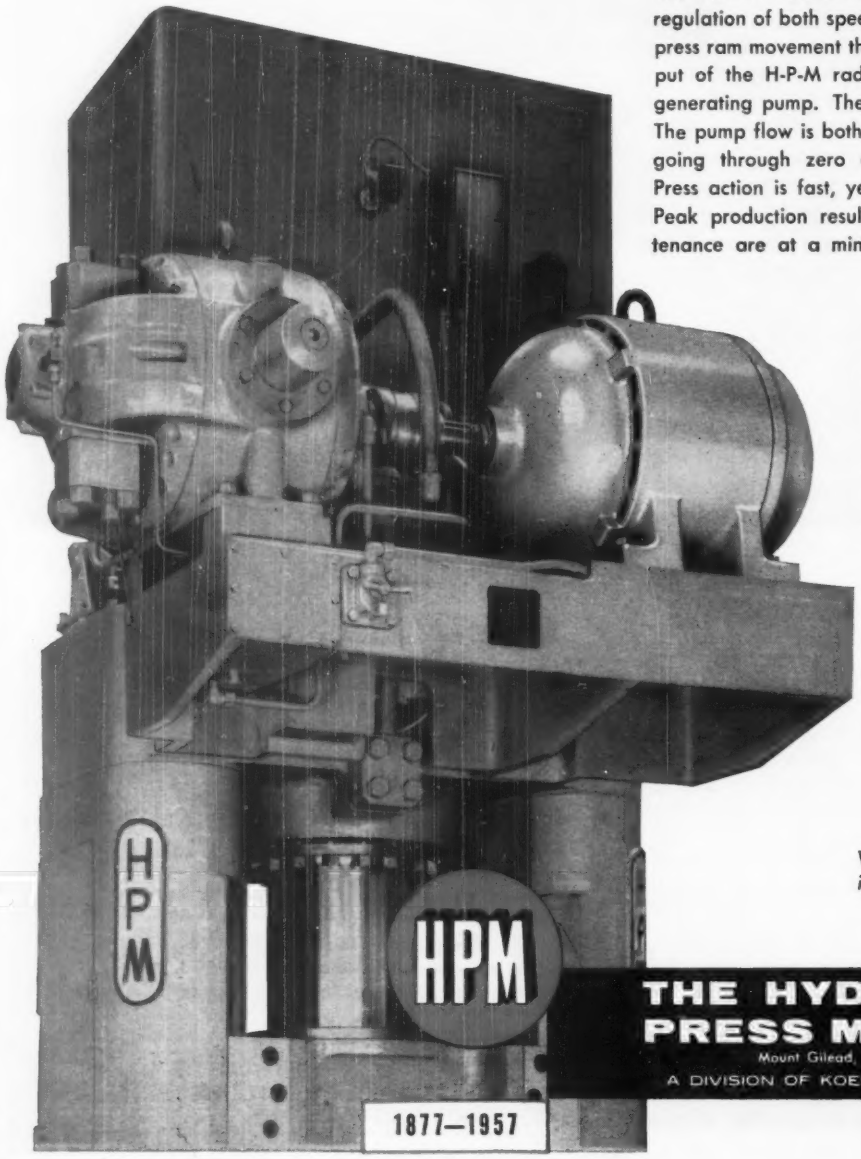
Fastraverse Ram Return

At reversal, pump delivers oil to supporting area by reversing direction of oil flow through pump. At this time, FASTRAVERSE prefill system opens and allows excess oil not handled by pump to be discharged back to tank.

FASTRAVERSE CLOSED CIRCUIT PRESS SYSTEM

Automatic Speed and Cycle Control

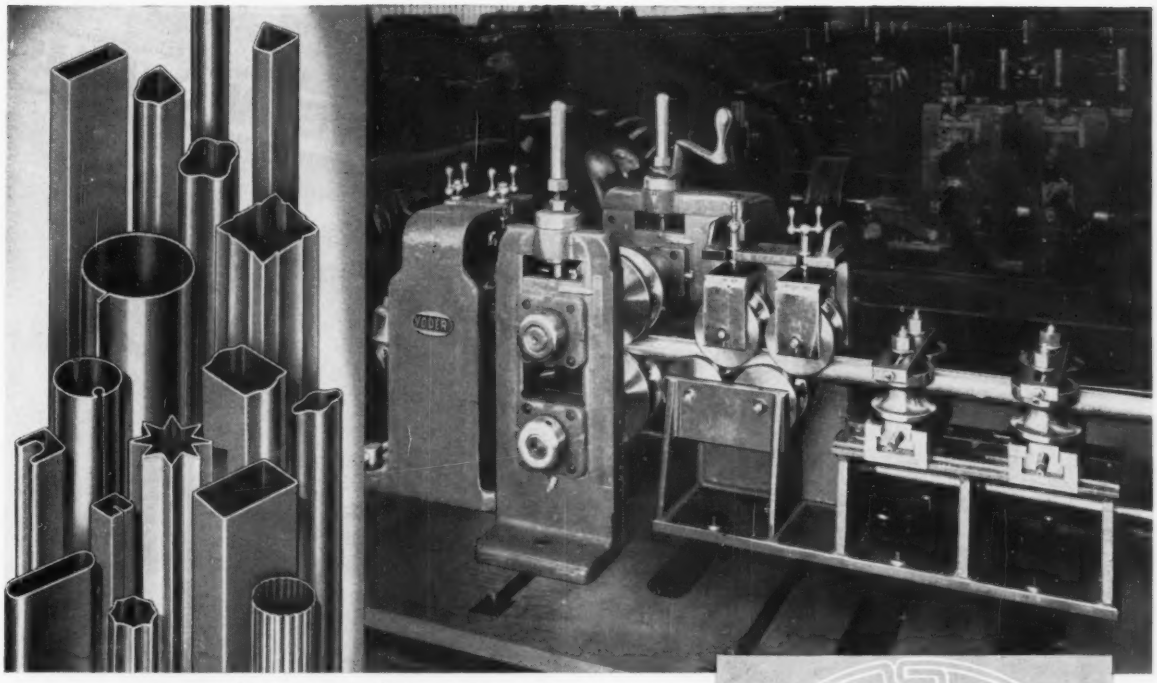
The H-P-M "Closed Circuit" system provides regulation of both speed and direction of every press ram movement through control of the output of the H-P-M radial piston type pressure generating pump. There is no reversing valve. The pump flow is both variable and reversible, going through zero at each press reversal. Press action is fast, yet smooth and shockless. Peak production results; idle time and maintenance are at a minimum.



Thousands of H-P-M FASTRAVERSE presses are in service today. Their dependability through performance is your assurance of satisfaction.

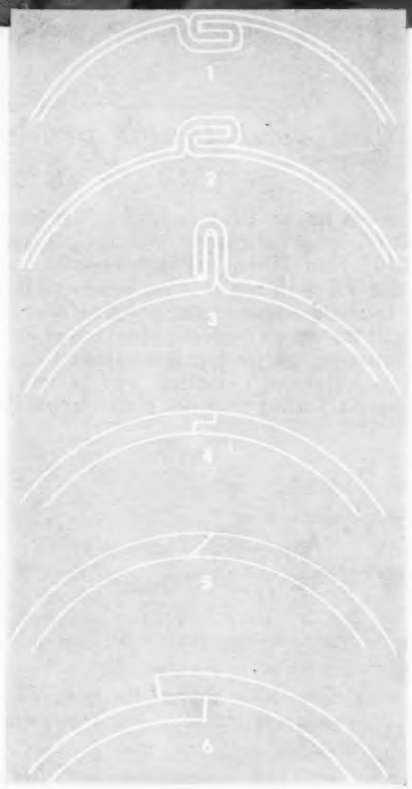
Write for complete information Bulletin 5500

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.
A DIVISION OF KOEHRING COMPANY



Lock-Seaming attachment at exit end of forming machine.

COLD ROLL FORMING TUBULAR SHAPES



Among the wide variety of things you can make on a Yoder Cold Roll Forming machine are round, square, oval, rectangular and other tubular shapes, such as illustrated at left above. The seams may be open, lapped, butted, dovetailed, interlocking, etc.—as indicated in Figures 1 to 6 at the right.

Millions of feet of such unwelded tubular shapes are made from coiled strip for conductor pipe, bedsteads, lamp stands, window channel, wiring raceways, carrying rods, etc. Production ranges from 20,000 to 50,000 feet per day, with only one operator and a helper.

Yoder offers you the cooperation of their engineering staff for designing and adapting their cold roll forming machines, auxiliaries, and tooling, for the low cost production of structurals, mouldings and trim, panels, tubular and other shapes, to meet individual needs.

The Yoder book on Cold Roll Forming is a complete, illustrated text on the art and the equipment needed for performing a variety of operations which can be combined with cold roll forming, at little or no extra labor cost. A copy is yours for the asking.

THE YODER COMPANY
5504 Walworth Avenue **Cleveland 2, Ohio**

ENGINEERING YODER MANUFACTURING

COLD ROLL FORMING MACHINES
ROTARY SLITTING LINES
PIPE AND TUBE MILLS—Electric Weld

VK

USE OUR SKILLS on YOUR LAPPING PROBLEMS

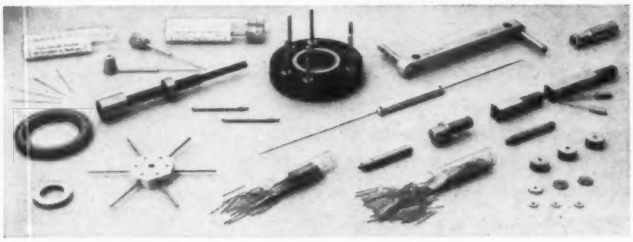


If that tough production part has Gage Characteristics, try the Van Keuren Precision Lapping Service--

The Van Keuren Co. laps optical flats to an accuracy .000001", gage blocks to .000004", plug gages to .000010". Your job may not be this precise, but it's a safe bet that VK skills can save you money on lapping problems involving size, flatness, parallelism or fine surface finish. If that tough production part has at least one gage characteristic, ask for a quotation from VK.

We lap flat and cylindrical work in both metals and non-metals. Sealing rings and plates for pumps and pressure devices, precision pins, spacers, pistons, punches, *carbide pivots*, valve parts, instrument components and parts for testing inspection equipment, are among the customer items handled economically here in our plant.

If you require lapped or polished surface finishes in the order of .5 to 5.0 RMS, or dimensional tolerances from .000001" to .0001", The Van Keuren Co. can probably help on the problem. The "rule of thumb," as suggested above, is "at least one gage characteristic."



Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

38th YEAR

THE Van Keuren CO.,

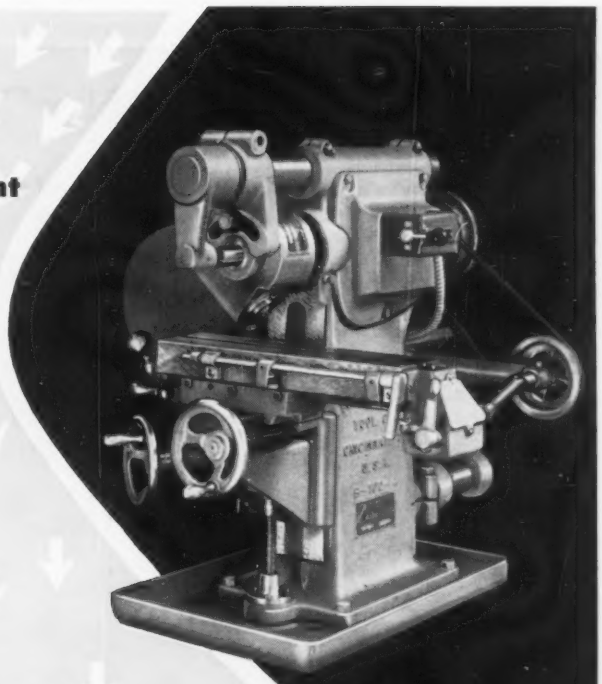
178 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.



Small parts bottlenecks strangling your milling department ?





U·S·Burke

MILLING MACHINES

Free Big Mills for Big Jobs!

No. 1 U. S. MILLING MACHINE

The top-quality precision mill, economically priced! May be hand operated, or equipped with air-hydraulic feeds for high production applications.

This accurate and simple-to-operate mill brings small part production into balance, with low-cost operation that avoids wasted time and investment in big mills.

Excellent for keyways, quantity runs of small pieces, such as sectors, short racks, simple profiling, sawing, slotting, squaring, cut-off, short-run splining, even light slab milling.

BURKE BENCH MILLERS

Here's small part milling accuracy for either toolroom or production uses. Choose between 2 hand and 2 power feed models.

Rugged frame, hand scraped thruout, Timken bearings . . . in a time-tested design that provides accurate milling, drilling, sawing, boring, facing and slotting of small parts.

Wide range of speeds handles any material. Dependable performance and ease of set-up lower operational costs on all types of small parts. Vertical Milling Attachment and complete range of other accessories available.

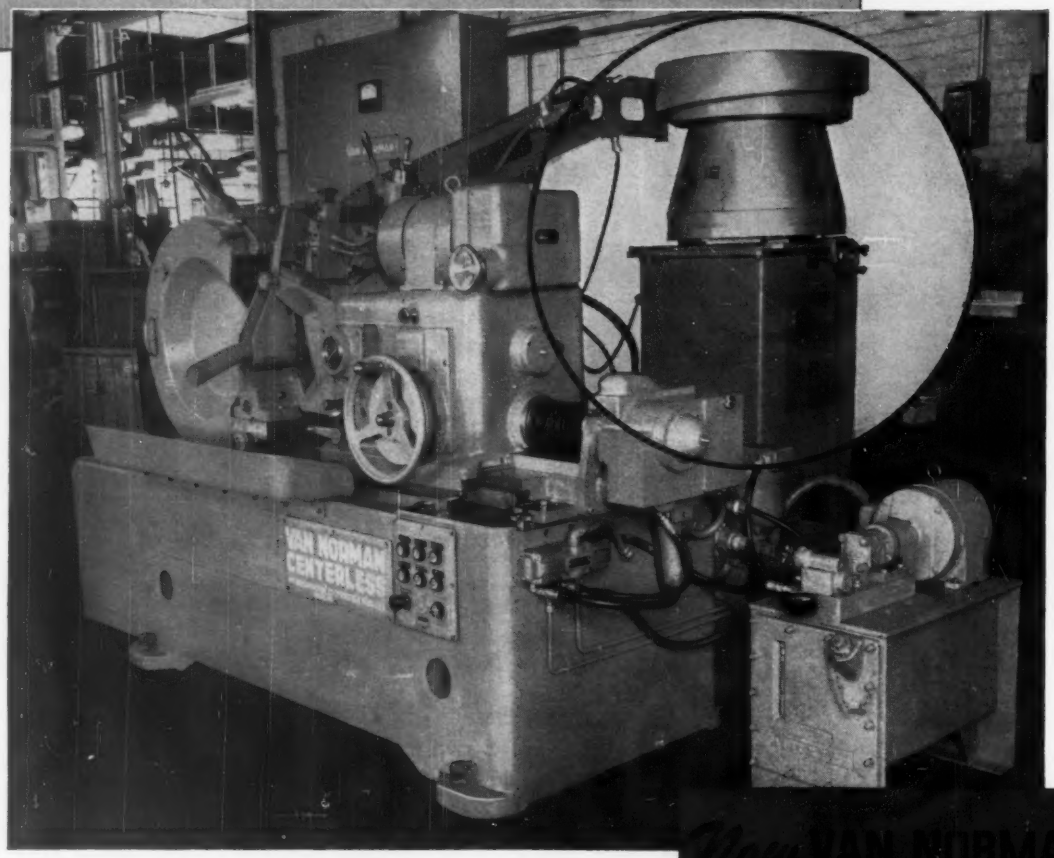
Write for complete specifications and prices

U·S·Burke MACHINE TOOL DIVISION

17 Brotherton Road • Cincinnati 27, Ohio

Manufacturers of the U. S. Vertical Milling Machine and the radically new U. S. Quartet

PRODUCTION EQUIPMENT produces MORE with Peeco



As a leader in the field of vibratory parts feeders PEECO is contributing its share towards the greater capacities being achieved by new production equipment. We are glad to include, among the companies in this field now being served by PEECO, the Van Norman Machine Co. of Springfield, Massachusetts.

If you want to produce more, send for bulletin #356 and ask for the name of the PEECO representative in your area.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF VIBRATORY PARTS FEEDERS

Now VAN NORMAN MACHINE COMPANY production equipment includes DEVELOPED PEECO FEEDERS

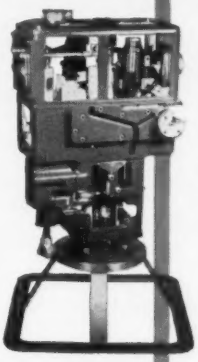
PEECO works with original equipment manufacturers to help engineer greater capacities into new production equipment. This Van Norman Centerless illustrates a single PEECO feeder (Model 25) installed with orientation track.

Peeco PERRY EQUIPMENT & ENGINEERING CO.

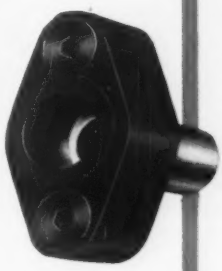
ERIE, PA. • • • DIVISION OF AUTOMATION DEVICES, INC.

5 practical ways to "streamline"

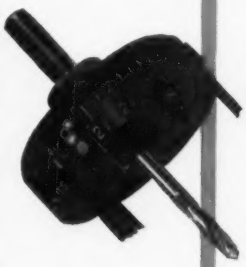
...without sacrificing fastening strength



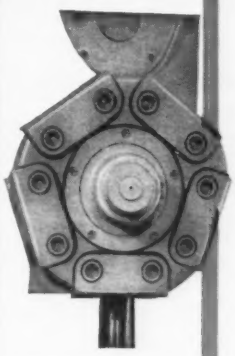
1. Counterbored holes are the simplest approach to flush surfaces using standard socket cap screws. The advantage of specifying genuine Allen O Head Cap Screws is the greater strength of Allenoy steel... you can use smaller sizes for closer spacing and reduced weight. Call on Allen, too, for *very large* socket-head, precision cap screws — up to 2½ inch diameter.



2. Countersinking enables you to get absolutely smooth external surfaces using Allen O Flat Head Cap Screws. Allen O Cap Screws feature the exclusive Leader Point which makes screw starting easier and guards against thread damage.



3. Button Head Cap Screws produce snag-free unbroken surfaces where countersinking is impractical. Button-head hex sockets are necessarily shallow. In genuine Allen O Button-Head Cap Screws, sockets are cold forged without broaching, in extra strength Allenoy steel... essential protection against stripping the sockets under high torque pressure.



4. A ready made hole tapped in forged steel solves many a design problem. It's called the Allenut. It can be anchored in soft material to assure durable threading, or recessed to permit tightening with an Allen Hex Key.



5. Bright finish, or rust and corrosion resistance call for Allen O Stainless Steel Cap Screws. They are standard stocked items (both NF & NC threads) readily available in a wide range of sizes from Allen Distributors.

YOUR ALLEN DISTRIBUTOR can give you practical help and swift service. For complete information on any technical fastening problem, write our engineering department direct.

ALLEN HEAD

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut, U.S.A.

For more information fill in page number on Inquiry Card, on page 239



MULTI-CARTRIDGE OIL FILTER quickly pays for itself...

CFC

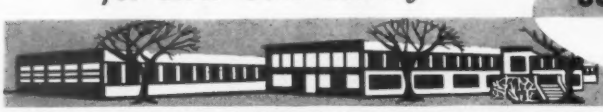
- In prolonged oil life
- Reduced down time
- Protection of machine parts

You quickly save enough — in oil bills alone — to pay the low initial cost of CFC Multi-Cartridge Filters. Even more important, you protect vital moving parts from the damaging effects of oil impurities. And by reducing down time, you maintain peak production.

The CFC (formerly Honan-Crane) Multi-Cartridge Oil Filter gives you a choice of six types of interchangeable cartridges for selective filtration of practically all types of oils under all operating conditions: cutting, quenching and rolling-mill oils; transformer and insulating oils; turbine and vacuum pump oils; fuel and lube oils. Filter media include inert cellulose, cotton waste, excelsior, paper and Cranite (Fuller's earth) for removal of soluble impurities as well as abrasive solids. You select the type of cartridge to fit your exact needs — depending on the nature and degree of contaminant, viscosity and temperature of oil, clarity and flow rate desired.

A Commercial Filters Engineer is ready to demonstrate how you can increase production and save money by installation of one or more CFC Multi-Cartridge Filters. Write for technical literature to Department MA.

Micro-Fine Filtration for Low Cost Clarity



COMMERCIAL FILTERS CORPORATION

MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

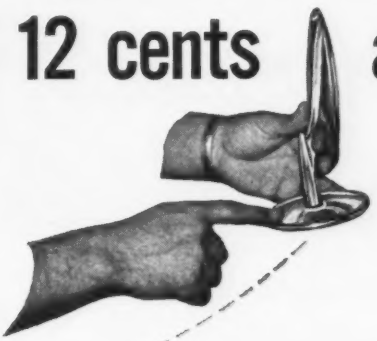
FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS
PURIVAC INSULATING OIL CONDITIONERS • DRI-PURE WATER-OIL SEPARATORS • PRE-COAT FILTERS • MAGNETIC SEPARATORS
AUTOMATIC TUBULAR CONVEYORS • COOLANT CLARIFIERS

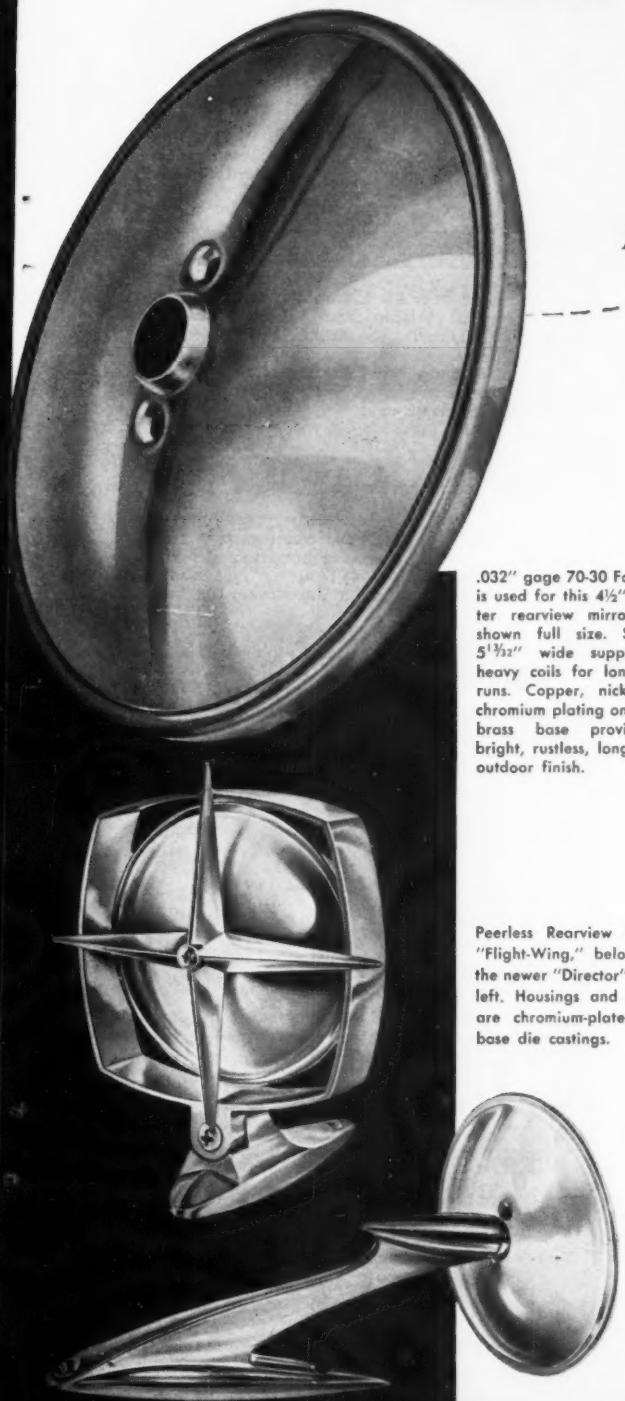
For more information fill in page number on Inquiry Card, on page 239

Bob Rossi, Chief Engineer, tells
Roy Johnson, Plant Manager



"We switched to Formbrite —and saved 12 cents apiece!"





.032" gage 70-30 Formbrite is used for this 4½" diameter rearview mirror head shown full size. Strip is 5 1/32" wide supplied in heavy coils for long press runs. Copper, nickel and chromium plating on a solid brass base provides a bright, rustless, long-lasting outdoor finish.

Peerless Rearview Mirrors. "Flight-Wing," below, and the newer "Director" model, left. Housings and mounts are chromium-plated zinc-base die castings.

This easy-to-polish, superfine-grain drawing brass has been slashing finishing costs in plant after plant, on all kinds of jobs. Now Peerless Accessories Co., of Mount Holly, N. J., reports:

"To our line of lighting and safety automotive accessories, we've recently added two rearview mirror assemblies. We had been using regular drawing brass for the dished head until your representative persuaded us to try Formbrite. Here are the results, based on a very careful cost study:

Finishing procedure using regular drawing brass	Present procedure using Formbrite*
1) Grease grinding or "cutting"	Not necessary with Formbrite
2) Buffing	Light buff
3) Copper strike	Copper strike
4) Nickel plate (.00045")	Bright nickel plate (.0003")*
5) Buffing nickel	Not necessary
6) Chromium plate	Chromium plate
Cost 27¢ each	**Cost 15¢ each**

"That's a saving of 12 cents apiece. Multiply it by 3,000 to 4,000 a day and it becomes important money!"

*Formbrite's superfine grain made possible a lighter but equally serviceable plate of bright nickel

Surprisingly, Formbrite doesn't cost a penny more. Find out for yourself how its superfine grain, excellent drawing properties, strength, and scratch resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask us about a sample lot. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 8870

Formbrite FINE-GRAIN DRAWING BRASS

an ANACONDA product
made by The American Brass Company

Announcing "ADJUSTABLE-STROKE" MIDGET Air-Clamp* CYLINDERS



Actual overall length of horizontal models, including ram extension, 3½", 5", 6".

"More per hour, with Mead Air Power"

Now—put pressure where it's wanted instantly and cheaply—with Mead's powerful new midget air cylinders (1" bore, single-acting, spring return.) Stroke is adjustable. Use 'em singly or in groups to move, hold, press or eject small work pieces; to close and open large jigs, forms, fixtures. They'll replace human fingers and mechanical clamps in countless routine jobs.

These new Midget Air Clamp cylinders bear the new Mead label of Guaranteed Quality. Each is guaranteed to give you millions of trouble-free cycles—to be a better value, dollar for dollar, than any comparable cylinder. Try them!

*TRADE MARK



Actual overall height of vertical models, including ram extension, $3\frac{9}{32}$", $4\frac{25}{32}$" and $5\frac{25}{32}$".

PATHFINDER IN AIR POWER AUTOMATION

New! —SAVES TIME!

These six brand-new Air Clamp cylinders with adjustable strokes variable from ½" to 3" can be put to work where longer strokes are needed *and* stroke can be "tuned" to exact length wanted even *after* setup is made! This feature alone multiples their usefulness, saves hours of time designing, laying out special jigs, fixtures.

New! —SAVES AIR!

Stroke change quickly made with spanner wrench (included with cylinder). You can conserve air in large fixtures (where dozens or hundreds of Midget Air Clamp cylinders are used) by using "just enough-no more" stroke. The shorter the stroke, the faster the cycle.

New! —SAVE SPACE & MONEY!

You can shorten stroke to the minimum to save space in cramped quarters. The cylinder "nose" telescopes into barrel reducing stroke and overall length. All this at prices so low you can almost *forget* their modest first-cost. But you'll *remember* the countless man-hours saved—the lessened fatigue of your workers at monotonous jobs—the improved quality and accuracy of their work!



Write Factory or Nearest Mead Representative For Bulletin L-27

(See Alphabetical Index of Thomas' Register for address, phone number.)

Midget Air Clamps are a Quality-Guaranteed product of

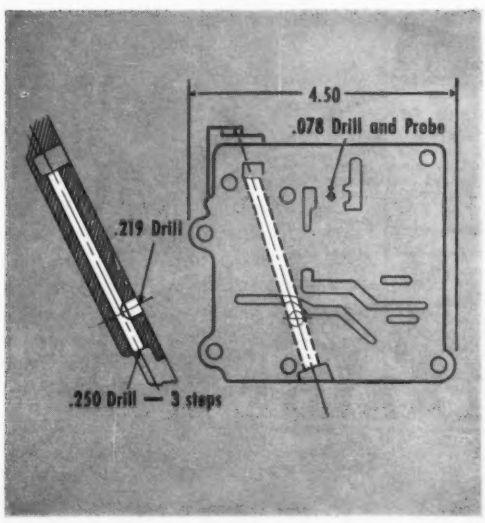
MEAD
SPECIALTIES COMPANY
DEPT. L-27, 4114 N. Knox Ave.,
CHICAGO 41, ILLINOIS

drilled and probed automatically in one chucking on a KINGSBURY



Case Study 3749

THREE HOLES
IN THIS TRANSMISSION VALVE COVER
. . . 5 OPERATIONS
. . . 350 PARTS PER HOUR GROSS

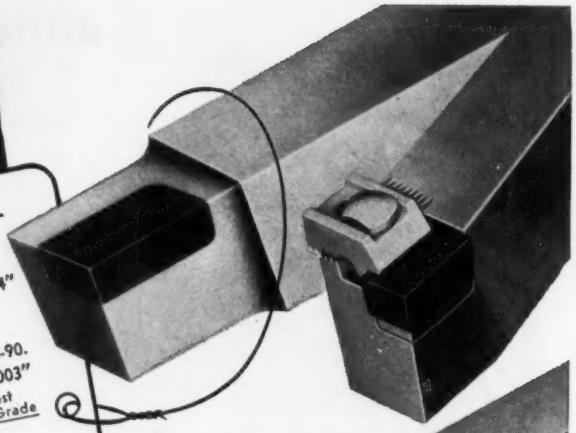


The machine drills three holes in this aluminum die casting. The customer asked us to probe the tiny .078 hole as the best means of inspection. An air-actuated mechanical probe operates at the next station after this drilling. If the hole is not drilled, the probe trips a limit switch which stops the machine.

We pioneered in these indexing automatics and we still think we can build them better than anyone else. They will produce to your specifications. If you have critical high production drilling and tapping jobs, we'd like a chance to show you what we can do Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY
INDEXING AUTOMATICS
for high production drilling and tapping

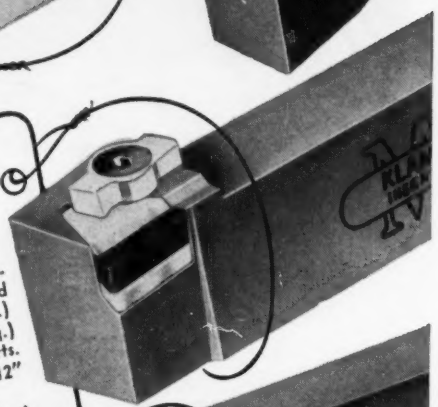
Talide® Tools... PROVED BEST BY TEST!



COSTS ONLY $1.65 Leading appliance manufacturer gets superior results with Talide standard brazed-type tool.

Machine.....Gisholt Turret Lathe.
Part.....Stud for automatic washing machine 3/4" dia. x 4" long, 1045 Steel, Rockwell 28 "C".
Operation.....Complete finishing including threading of end.
Tool.....Standard Talide tool AL-10-5/8" sq. x 4", Grade S-90.
Speed (S.F.M.).....400 Feed.....005" Depth of Cut.....003"

	Talide Grade S-90	Next Best Premium Grade
Average No. of pcs. per grind	600	475
Average No. of regrinds per tool	16	14



90 DAYS OF GRUELING TESTS at eastern aircraft engine plant rates Talide Grade S-92 "Best by Test."

Here is one typical result:
Machine.....36" Bullard Multimatic
Material.....AMS-5613 Stainless Steel
Operation.....Facing, turning and boring 21" O.D. x 2.5" thick casting to size. (Heavy scale, bead weld, and out of round surfaces presented adverse machining conditions.)
Tools.....TN-163P3 (1/2" I.C.) and SN-243P3 (3/4" sq.) Talide "Throw-away" triangular and square inserts.
Speed (S.F.M.).....375 to 1100 Feed.....006" to .012"
Depth of Cut.....060 to .500
Result.....27-34 Pc. average compared to 7-12 for next best premium grade—plus tool breakage cut 75%.

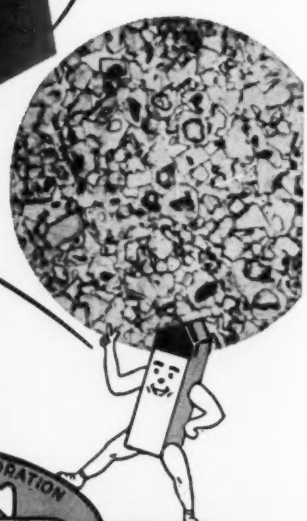


BEST CUTTING METAL FOR MACHINING CRANKSHAFTS

A large midwest automotive plant recently conducted an extensive test to determine the best cutting metal for machining crankshafts—the results proved TALIDE "BEST BY TEST!"

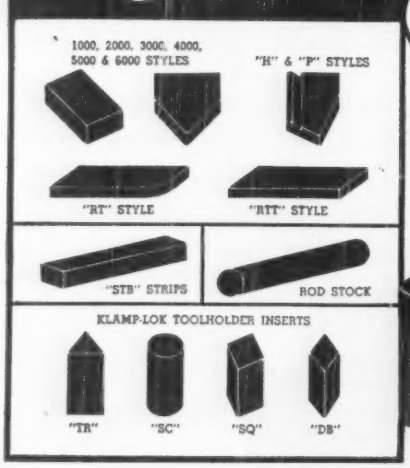
Machine.....Fay Automatic Lathe Feed.....006"
Speed.....800 R.P.M. Depth of Cut.....035"
Cutting Tool.....Style TB-12123 Triangular Insert

Material	Talide Grade S-90	2nd Best Carbide	3rd Best Carbide
1141 Steel	175 pcs.	120 pcs.	97 pcs.
4140 Steel	128 pcs.	70 pcs.	65 pcs.
Armor Steel	83 pcs.	65 pcs.	65 pcs.



CONSTANT RESEARCH PAYS OFF!

Year after year Talide metal improves in hardness, strength, rupture resistance and crater resistance properties. Processed in latest type vacuum electric furnaces under rigid laboratory control—all Talide grades are uniform and consistent in quality.



Call in a Talide sales engineer to recommend proper tooling for your machining operations, or write for 76-page catalog No. 56-G. METAL CARBIDES CORPORATION, 6001 Southern Blvd., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
MC TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Talking About Die Sets



with
Phil Marsilius
Vice-President
The Producto Machine Co.

Master or Commercial: What Makes the Difference? The most obvious difference between a Master (Precision) set and a Commercial set is the price. The Commercial set costs less because less assembly time is required in its manufacture. Punch holder and die holder tolerances are the same for both grades of die set. However, extremely close tolerances for fit between pins and bushings on Master sets require more accurate honing of bushings in assembly. Master die set tolerances for parallelism between punch and die holder are also more critical than those for Commercial die sets.

Normally, the difference between pin and bushing diameters on die sets manufactured by our industry is never less than .0002" and ranges as high as .0009". There are die sets made to closer or looser tolerances than these, but generally speaking, the majority of die sets fall into this category.

Master die sets are manufactured to the low side of this tolerance scale and are held to a maximum of .0004" differential. This closer tolerance increases the useful life of precision sets by allowing for wearing of the pins and bushings in operation.

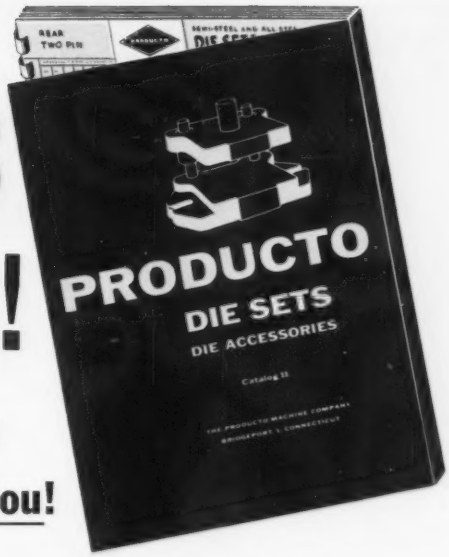
Commercial die sets are made throughout the entire range of this tolerance scale and, more often than not (to reduce assembly cost), are made to the higher tolerances. As a result, their accuracy will usually decrease much faster than that of Master die sets. While it is possible with this tolerance range to receive a Commercial set with the minimum pin and bushing fit allowed, you can be certain of longer die set accuracy only with a Master set, which is guaranteed to be held to the low side.

A "free-sliding fit" is one that permits the punch holder to move down on the guide pins of its own weight. It does not have any bearing on the degree of accuracy of the die set since a free-sliding fit can be supplied on both Master and Commercial sets. On Master sets, however, it is sometimes necessary to hone out the bushings to a full .0004" tolerance to provide a free-sliding fit.

EVERY die set MUST, of necessity, work freely in normal use, *on the press,* but catalog die sets should come apart and go together easily for bench work. With an occasional exception (when sets are made to the lowest tolerance for fit allowed), disassembly should be possible by hand without use of separating tools.

In making a choice, the degree of accuracy required and the life requirements of the die set should be the main points of consideration which determine whether you should order a Master or Commercial die set.

IT'S HERE!



A new catalog designed for you!

WRITE FOR YOUR COPY TODAY

Here, at last, is a die set catalog that makes your selection and ordering really easy. Producto's all-new catalog is compact for the die designer, convenient for the purchasing agent, a functional tool for the die maker.

These unique features make Producto's catalog much easier for you to use:

IT'S COMPACT. Though many items have been added, it has *fewer* pages because superfluous material has been eliminated. New products include Qwik-Fit Guide Pins, new Bushings with grease fittings, Lamina Bushings, Ring Punches and Dies, Toolroom Equipment, Lubrication Accessories and new Die Spring Selections.

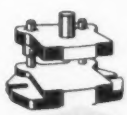
IT'S COMPLETE, containing the greatest selection of die sets and accessories that has ever been offered to date.

ALL PRICES ARE NET and appear in a *separate pricing supplement,* removed from the technical section. No more time-consuming "discount" calculations.

NEW BINDING ARRANGEMENT lets you look at technical and pricing information *simultaneously.* No more flipping pages back and forth to get complete information.

STREAMLINED PAGE LAYOUT makes it easier for you to find essential data. Color highlights catalog numbers and drawings.

To make your die set ordering as painless as possible, write today for a free copy of Producto's new Catalog No. 11.

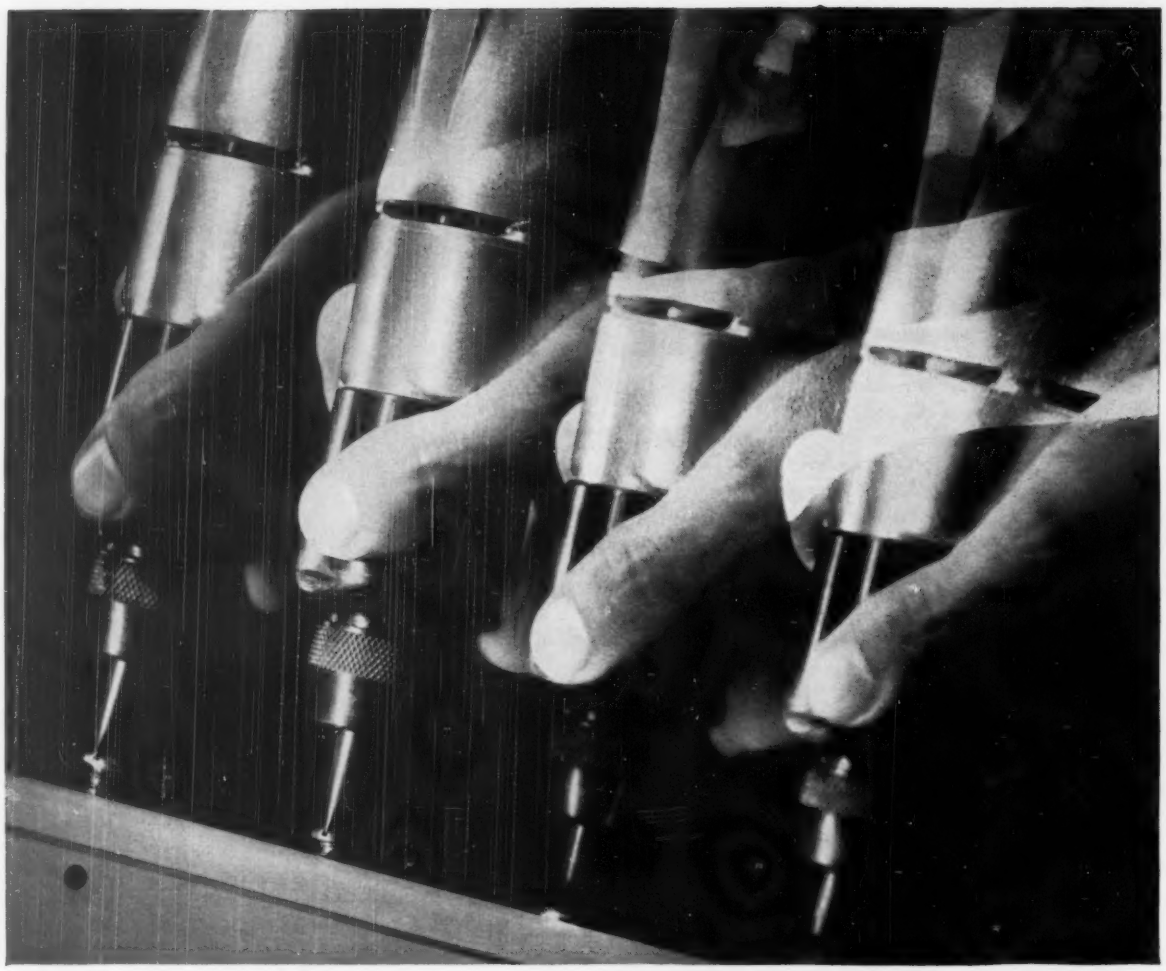


THE PRODUCTO MACHINE COMPANY
985 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



Is assembly one of your largest production costs?

It probably is. Wherever fastenings must be made, this simple truth applies: The cost of the fastener is but a tiny fraction of the cost of using that fastener in production. The key to reduced assembly costs is the fastener that helps high-paid assembly hands turn out better work—*faster*. The P-K® Self-tapping Screw is that fastener!

Using screws that don't come up to P-K standards can raise total assembly costs as much as 25%. Screw failures not only result in assembly slow-downs . . . but in parts spoilage and hidden weaknesses as well. This is especially true in assembly by automation. Uniformity, such as P-K Self-tapping Screws offer, is automation's prime requirement for trouble-free assembly.

Why not talk to a Parker-Kalon Assembly Engineer —a man who is in daily contact with many different assembly set-ups. Perhaps he can show you how to reduce the number of fastenings in your product or how to solve a particularly difficult fastening problem. (That's his business.) Contact him through your local Parker-Kalon distributor.

PARKER-KALON DIVISION, General American Transportation Corporation
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

PARKER-KALON® fasteners

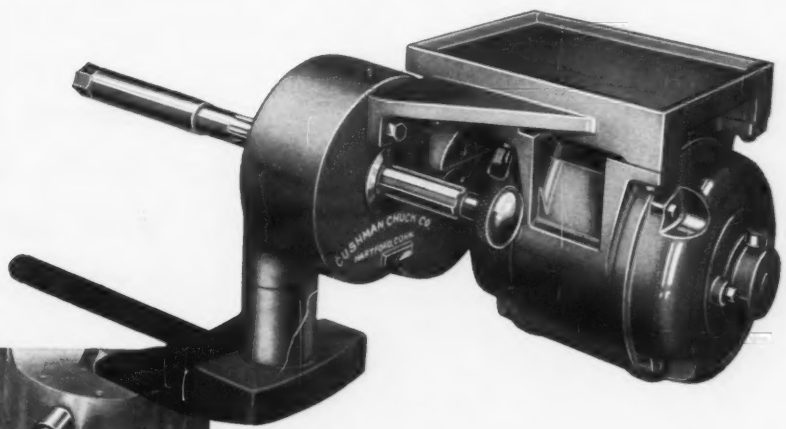
Sold Everywhere Through Leading Industrial Distributors
Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

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CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

the key to machining efficiency





The Cushman Power Wrench, push-button controlled, eliminates time-consuming, fatiguing, hand wrenching of chucks on single and multi-spindle machines, especially where repetitive machining operations are being performed.

Cushman Power Wrenches are available with either an 8 or 24 ft. lb. motor, delivering a maximum of 180 or 600 ft. lbs. torque respectively. With the addition of the Cushman Variable Torque Control, developed especially for use with the Power Wrench, the operator may, by setting the selector switch, choose any one of 9 approximately equal stages of torque and inertia. Wrenches equipped with 8 ft. lb. or 24 ft. lb. stall-type motors will deliver from 45 to 180 ft. lbs. or 150 to 600 ft. lbs. respectively.

If greater or less driving force is required, the Cushman Engineering Department can design wrenches to suit your needs. Write Cushman for Bulletin No. 211D fully describing and illustrating the Cushman Power Wrench — or, should you have a special work-holding problem, consult Cushman.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

a world standard for precision

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1862

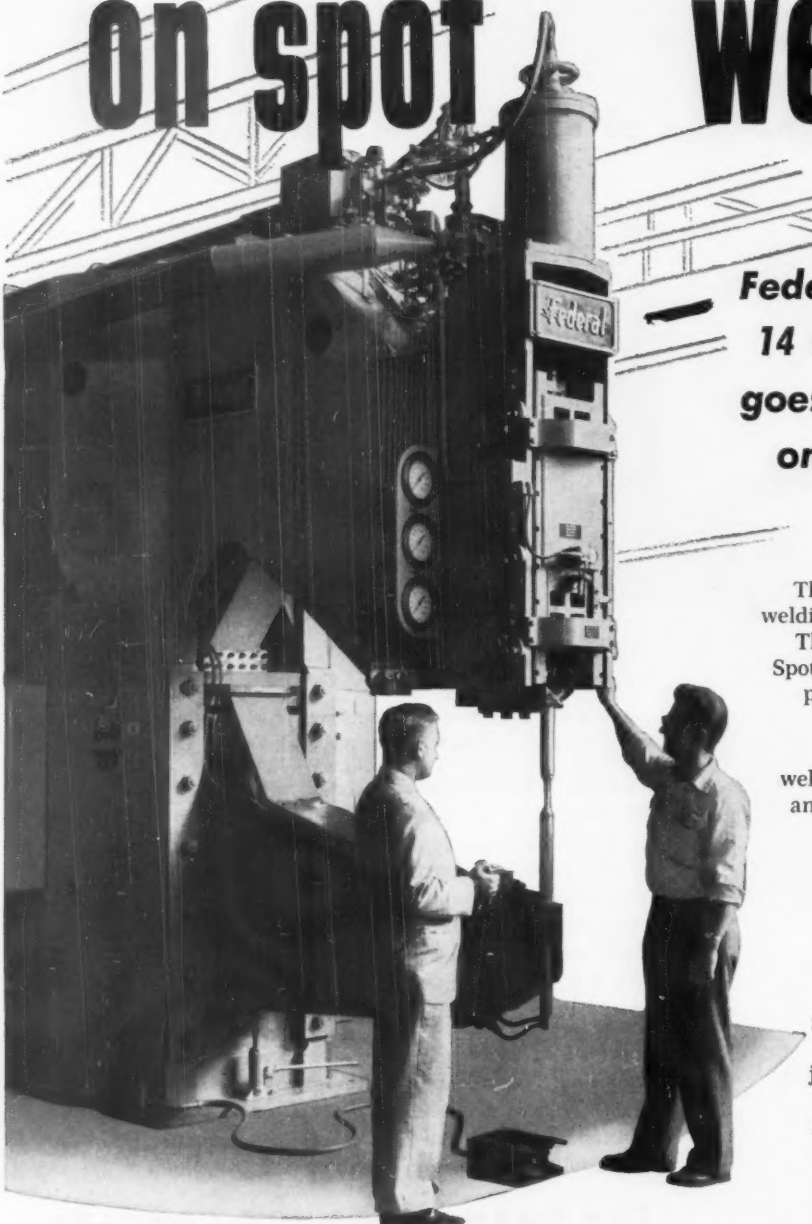
CUSHMAN CHUCKS . . .
A Product of American Quality, Labor and Materials

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

...the BIGGEST story on spot welding!



Federal Built 14 ft., 28 ton giant goes into operation on west coast . . .

The biggest thing in aircraft spot welding—that's the huge new Federal Three Phase Frequency Converter Spot Welder designed to make spec plus welds on the tail section of a new commercial jet airliner.

More than 13 feet tall, the big welder weighs over 58,000 pounds, and has a special throat, or work clearance area, of some 2500 square inches.

The design and manufacture of the 12 ton unipolar transformer having an output in excess of 100,000 amperes and the requirements of meeting rigid deflection specifications on this large throat machine were just a few of the new problems encountered on this project. Federal experience and facilities once more provided the correct solutions.

Here again, is proof that large or small—standard or special—*Federal Stays First in Resistance Welding.*

Welding engineers testing record setting spot welder. Federal has been commissioned to build several more of these giants for aircraft manufacture.

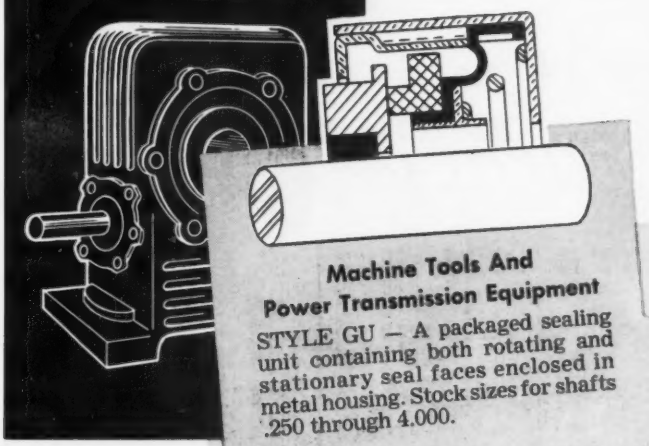
Federal® WELDERS

Warco® PRESSES

The Federal Machine and Welder Co.

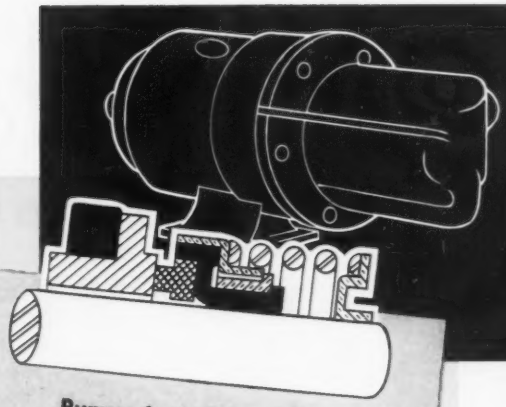
WARREN, OHIO

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Machine Tools And Power Transmission Equipment

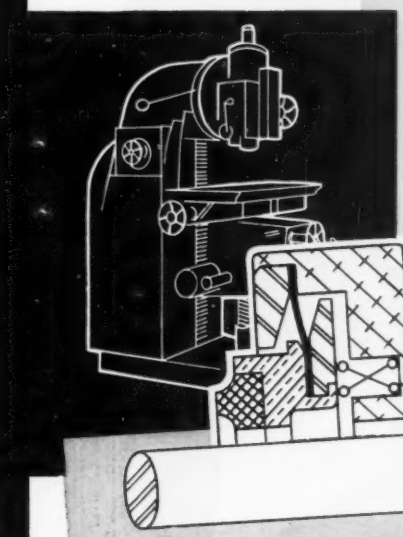
STYLE GU — A packaged sealing unit containing both rotating and stationary seal faces enclosed in metal housing. Stock sizes for shafts .250 through 4.000.



Pumps And Compressors

ROTO-FLEX — Rugged flexibility. Only 3 parts. Single or double units. Stock sizes for shafts .250 through 4.000.

STYLE RFO — A specially designed Roto-flex seal, for installation outside the stuffing box. Stock sizes for shafts .250 through 4.000.



Heavy Machine Tools

STYLE DPC — A high-speed, carbon-faced seal, for more compact installation in heavy industrial machinery. Stock sizes for shafts .250 through 4.000.

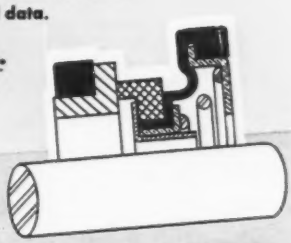
A Complete Line
GITS SHAFT SEALS
For Every Application

These modern, mechanical, face-type seals are carried in stock — to save you time and money. Write for detailed data.

GITS BROS. MFG. CO.

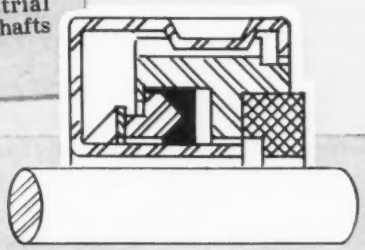
1856 South Kilbourn Avenue • Chicago 23, Illinois

Specialists In Lubricating Devices And Shaft Seals For Almost Half-A-Century



Household Appliances

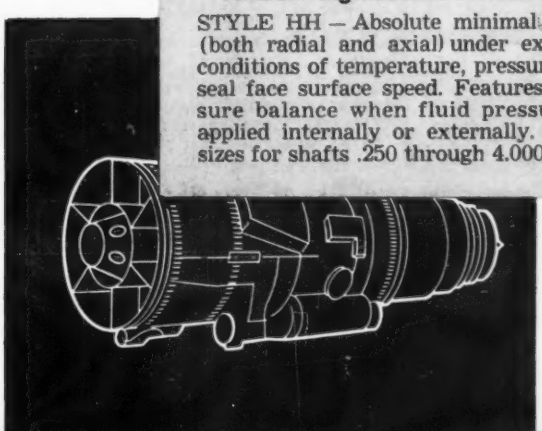
STYLE SGU—A factory-assembled unit-type seal for the small-budget user. Stock sizes for shafts .250 through 1.000.



Aircraft Engines And Accessories

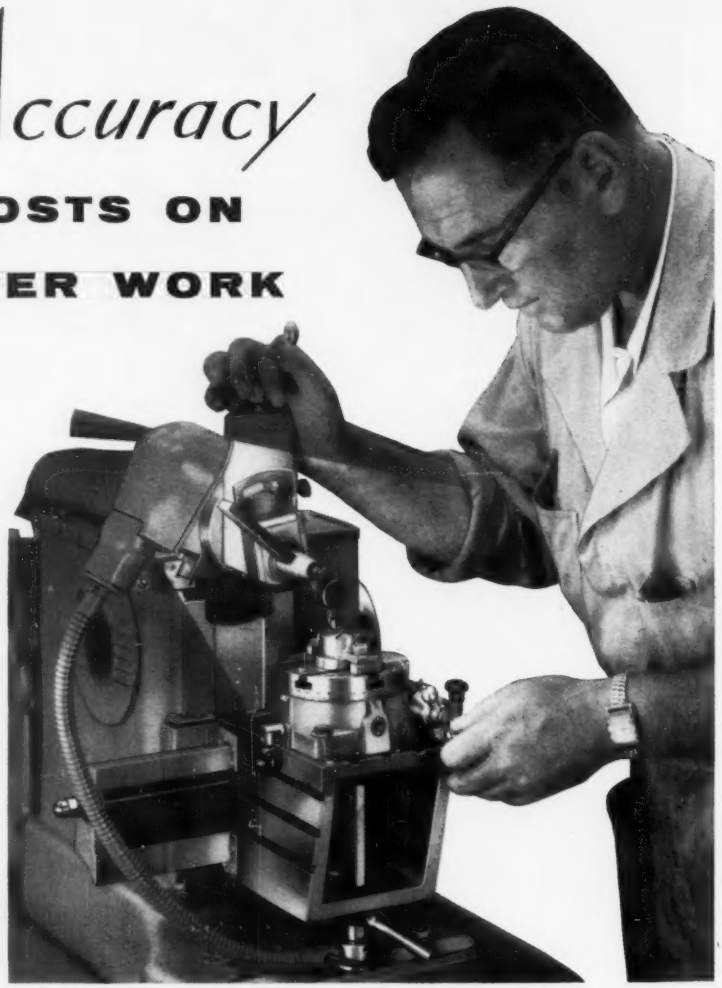
STYLE HH — Absolute minimal space (both radial and axial) under extreme conditions of temperature, pressure and seal face surface speed. Features pressure balance when fluid pressure is applied internally or externally. Stock sizes for shafts .250 through 4.000.

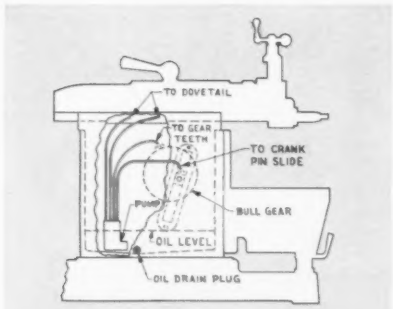




Speed-Accuracy

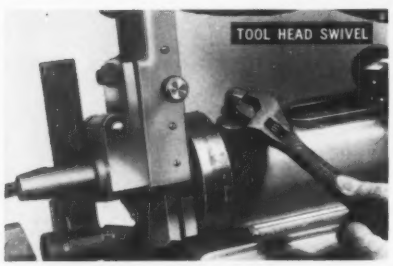
TO CUT COSTS ON SHAPER WORK





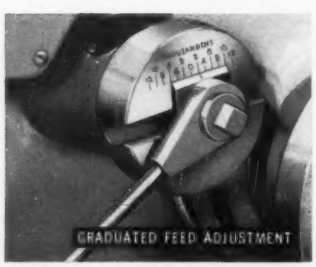
ONLY 7" SHAPER WITH FORCED FEED LUBRICATION

Oil pumped under pressure to the ram dovetail, bull gear and pinion, pinion shaft and rocker arm shaft. Keeps wear to a minimum—helps absorb shock of intermittent cuts.









The cost of machining small work drops when a South Bend 7" Precision Bench Shaper takes over. Its higher strokes per minute—greater ease of set-up—and handling speed give it a decided advantage over larger shapers that never were designed for small work. Also, its accuracy is a match for exacting toolroom requirements. If you are interested in better shaper work at lower costs, write for literature. Price, less motor and stand—$573.

SPECIFICATIONS

Ram Stroke—0 to 7". *Strokes* per min.—42 to 195 approx. *Cutting Speeds*—3 to 114 ft. per min. *Tool Head*—3" vertical travel, 360° rotation. *Table*—9½" horizontal travel, 5" vertical travel. *Table Power Cross-Feeds*—(6) .002" to .012" (reversible).

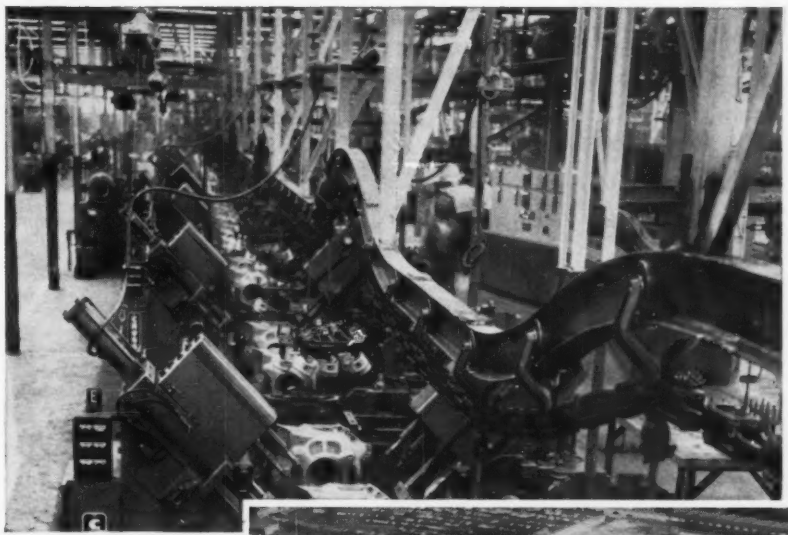
SOUTH BEND LATHE SOUTH BEND 22, INDIANA

BUILDERS OF LATHES, VERTICAL SPINDLE MILLING MACHINES, SHAPERS, DRILL PRESSES, PEDESTAL GRINDERS

SOUTH BEND

For more information fill in page number on Inquiry Card, on page 239

In the Spectacular PLYMOUTH ENGINE PLANT you see



(Above) View of Plymouth Engine assembly line



VICKERS®
HYDRAULICS
Wherever You Look

Plymouth Engine Plant is 980' long and 500' wide. Indicative of its scope is crankshaft machining requiring 4500 linear feet of automation composed of 385 individual units. Plant capacity is 150 engines per hour.

In the new Plymouth "Qualimatic" Engine plant you see Vickers Hydraulics on every side. Hundreds of machines in this latest and greatest example of automation are Vickers equipped.

Both builders and users of production equipment appreciate the significant advantages of Vickers Hydraulics . . . advantages that help produce better products at lower cost.

A specific need in the Engine Plant is standardization on a few basic hydraulic units to keep down parts inventories. The Vickers line makes standardization easy. Also desirable are hydraulics in units quickly demountable . . . so that by replacing units, repairs on the job are avoided and costly downtime reduced. Vickers has extensively developed demountable unit construction.

Whether automated or not, more and more plants have more and more Vickers Hydraulics. For further information, write for Catalog 5002B.

VICKERS HYDRAULICS is used on machines supplied by these Companies to Plymouth Engine Plant

American Broach & Machine Co.
Barnes Drill Company
Bilt-Rite Tool & Machine Co.
Buhr Machine Tool Company
Colonial Broach & Machine Co.
Crankshaft Machine Company
The Cross Company
Ex-Cell-O Corporation
Fitchburg Engineering Corp.
Greenlee Bros. & Company
Industrial Metal Products
The LaPointe Machine Tool Co.
Landis Tool Company
The R. K. LeBlond Machine Tool Co.
Lees-Bradner Company
Michigan Drill Head Co.
Micromatic Hone Corporation
Micro-Poise Engineering & Sales Co.
Modern Industrial Engineering Co.
The Natch & Merryweather Machinery Co.
Norton Company
A. P. Schraner Co.
The Sheffield Corporation
Snyder Tool & Engineering Co.
Sundstrand Machine Tool Co.
Jervis B. Webb Co.
The Wickes Corp.
Wilson Automation Co.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
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Department 1403 • Detroit 32, Michigan

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7545

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Lapping For Precision Flatness and Parallelity in Production Quantities



...with a LAPMASTER

This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

THIS IS HOW THE LAPMASTER WORKS

I, a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.



1 Operator requires no previous lapping experience.



2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.



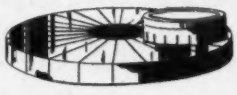
3 Simplicity of design provides accessibility and allows ease of loading and unloading.



4 Loose abrasive distributed evenly over lapping area insured uniform results.



5 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.



6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.



Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

Lapmaster is protected by United States and Foreign Patents.

CRANE PACKING COMPANY

6433 Oakton Street, Morton Grove, Illinois

Lapmaster Division **CRANE PACKING COMPANY** 38 YEARS INDUSTRIAL PROGRESS



For fast, smooth cutting of aluminum flats, billets, rods, extrusions . . . or any other soft metals and materials . . . Simonds has the right saw or file for any particular job. Made of special job-rated Simonds steels . . . by top men working under ideal controlled conditions in Simonds famed windowless factory . . . every Simonds tool has the bonus-factor of finest performance and longest life. Yes, on any metal-cutting job, remember: "Say Simonds . . . *and save*".

SOLID TOOTH SAWS
For best performance on automatic cut-off machines or saw tables and general run of work. Also furnished with carbide tips for production cutting.

SEGMENTAL TYPE SAWS
For thin wall sections and for smoother cutting of billets and thicker sections. Made with replaceable High Speed Steel teeth in segments.

INSERTED-TOOTH SAWS
For heavy duty cutting of billets and heavy sections. Replaceable High Speed Steel teeth.

"SABRE TOOTH" BAND SAWS
New design saw features a special tooth *with a hook*, for freer, faster cutting.

"RED END" HACK SAW BLADES
3 types, for hand or power cutting, each available in standard sizes and tooth-spacings, enable you to choose the one best blade for each job.

"RED TANG" FILES FOR ALUMINUM
Choose from a complete line . . . American Pattern, Milled Curved-Tooth, Rotary and Swiss Pattern Files. First quality only.

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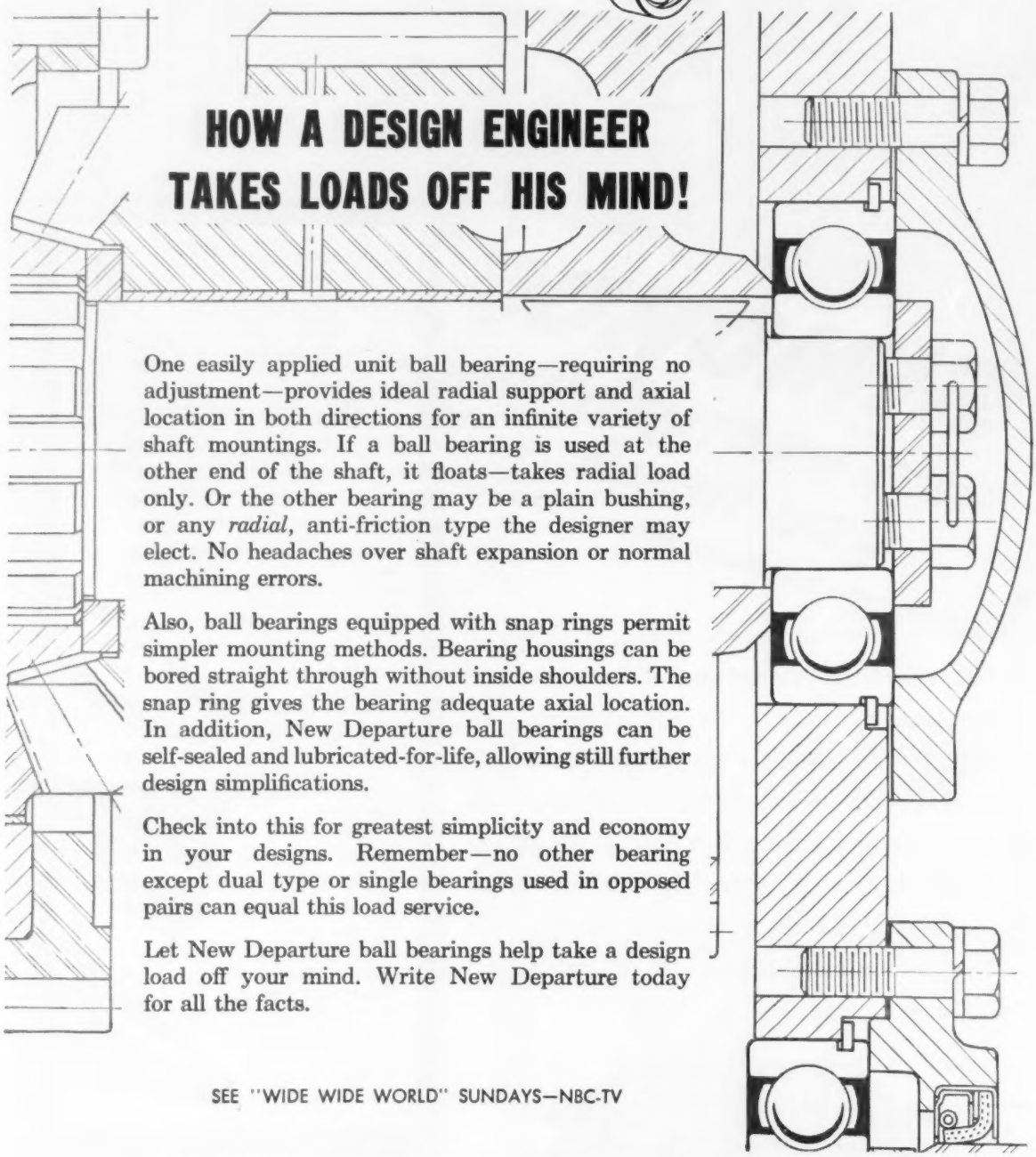
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FACTS

about

NEW DEPARTURE BALL BEARINGS





HOW A DESIGN ENGINEER TAKES LOADS OFF HIS MIND!

One easily applied unit ball bearing—requiring no adjustment—provides ideal radial support and axial location in both directions for an infinite variety of shaft mountings. If a ball bearing is used at the other end of the shaft, it floats—takes radial load only. Or the other bearing may be a plain bushing, or any *radial*, anti-friction type the designer may elect. No headaches over shaft expansion or normal machining errors.

Also, ball bearings equipped with snap rings permit simpler mounting methods. Bearing housings can be bored straight through without inside shoulders. The snap ring gives the bearing adequate axial location. In addition, New Departure ball bearings can be self-sealed and lubricated-for-life, allowing still further design simplifications.

Check into this for greatest simplicity and economy in your designs. Remember—no other bearing except dual type or single bearings used in opposed pairs can equal this load service.

Let New Departure ball bearings help take a design load off your mind. Write New Departure today for all the facts.

SEE "WIDE WIDE WORLD" SUNDAYS—NBC-TV

BALL BEARINGS MAKE GOOD PRODUCTS BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

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Skinner power chucks will cut your over-all machining costs

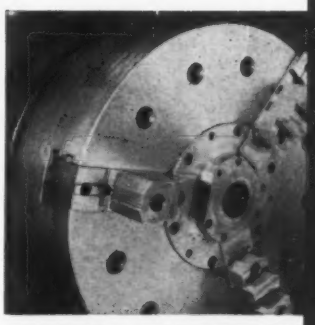
Right from the start, you begin to add up savings in cost-per-piece when you equip your production machines with Skinner Power Chucks. Instantaneous gripping and releasing by these air-powered Skinners cut substantially the over-all time required for machining.

If you're using manually operated chucks on your production machines, you're running your costs up with every cut, and wasting operators' time with hand wrenching. Skinner Power Chucks enable you to get the full time-saving advantages of modern engine and turret lathes by converting them to high production machines.

We'd like to show you how Skinner Power Chucks will reduce machining costs on production jobs in your plant. Write for Catalog 68P2, with complete specifications, applications and installation instructions.

Simple, Dependable Safe Operation

The tight gripping jaws are closed or opened instantly by an actuating wedge, operated by a double-acting air cylinder. This simple mechanism is positive and trouble-free—there are only four moving parts in the chuck head. If air pressure suddenly fails, the jaws do not release the work piece, but continue to hold it tight until air pressure is restored.



Operator's Hands Are Free To Guide Work Pieces

Skinner Power Chucks are operated either by foot or hand valves. The operator can position work pieces and close jaws instantly, sure that the piece is correctly and firmly held with equal pressure. Cuts operator fatigue, too—air pressure does the hard work.



SKINNER CHUCKS®

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

Product Directory

To find headings easily, look for capital letters at top of each page to denote location.

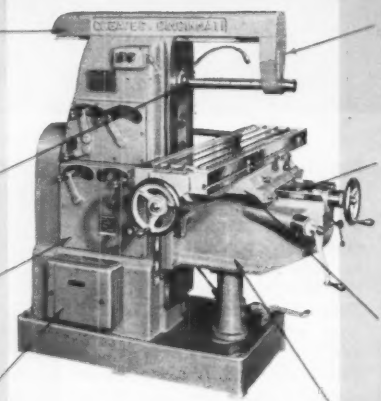
ABRASIVE CLOTH, Paper and Belt
Crane Packing Co., Morton Grove, Ill.

ABRASIVES, Discs
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg Philadelphia, Pa.

ABRASIVES, Polishing, Tumbling, Etc.
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Cratex Manufacturing Co., 81 Natoma St., San Francisco, Calif.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Pa.
Farrel-Birmingham Co., Inc., Ansonia Conn.
Watson-Stillman Co., Roselle, N. J.

Compare design then compare price
...you'll choose **GREAVES MILLS**
DESIGNED FOR ACCURACY



Overarm casting is rigid, boxlike structure; dovetail planed to perfect alignment with spindle.

Spindle and intermediate shafts jig bored for accurate alignment; mounted on over-size Timken bearings.

Heavy ribbed, box type, column casting assures rigidity.

Drive—5 HP 1750 RPM motor through multiple V-belt and dependable gear train; sliding gears in column are flame-hardened, mounted on spline shafts and are flooded with oil supplied by gear pumps with built in filter.

Husky arbor support has built-in oil reservoir, adjustable bronze bushing.

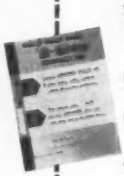
All sliding surfaces hand scraped to a bearing with mating member and with master gauges.

Line boring of table and saddle together *after scraping* assures proper alignment, provides free-running lead screw.

Knee is machine jig bored for accurate alignment. All units are indicator tested during assembly to meet established alignment for milling machines.

Wide range of speed-feed combinations for every class of work. Rapid traverse speeds operation.

- Rugged Greaves Mills are accurate and dependable, yet sell for thousands of dollars less than comparable machines.
- Make your own comparison. Send for free copy of Greaves Comparison Chart.



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2500 Eastern Avenue, Cincinnati 2, Ohio
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☐ The Comparison Chart. ☐ Tool Lease and Deferred Payment Plans.

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Schrader's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

AIR TOOLS—See Grinders, Portable, Pneumatic, Drills, Portable, Pneumatic, Etc.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Chicago Hts., Ill.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

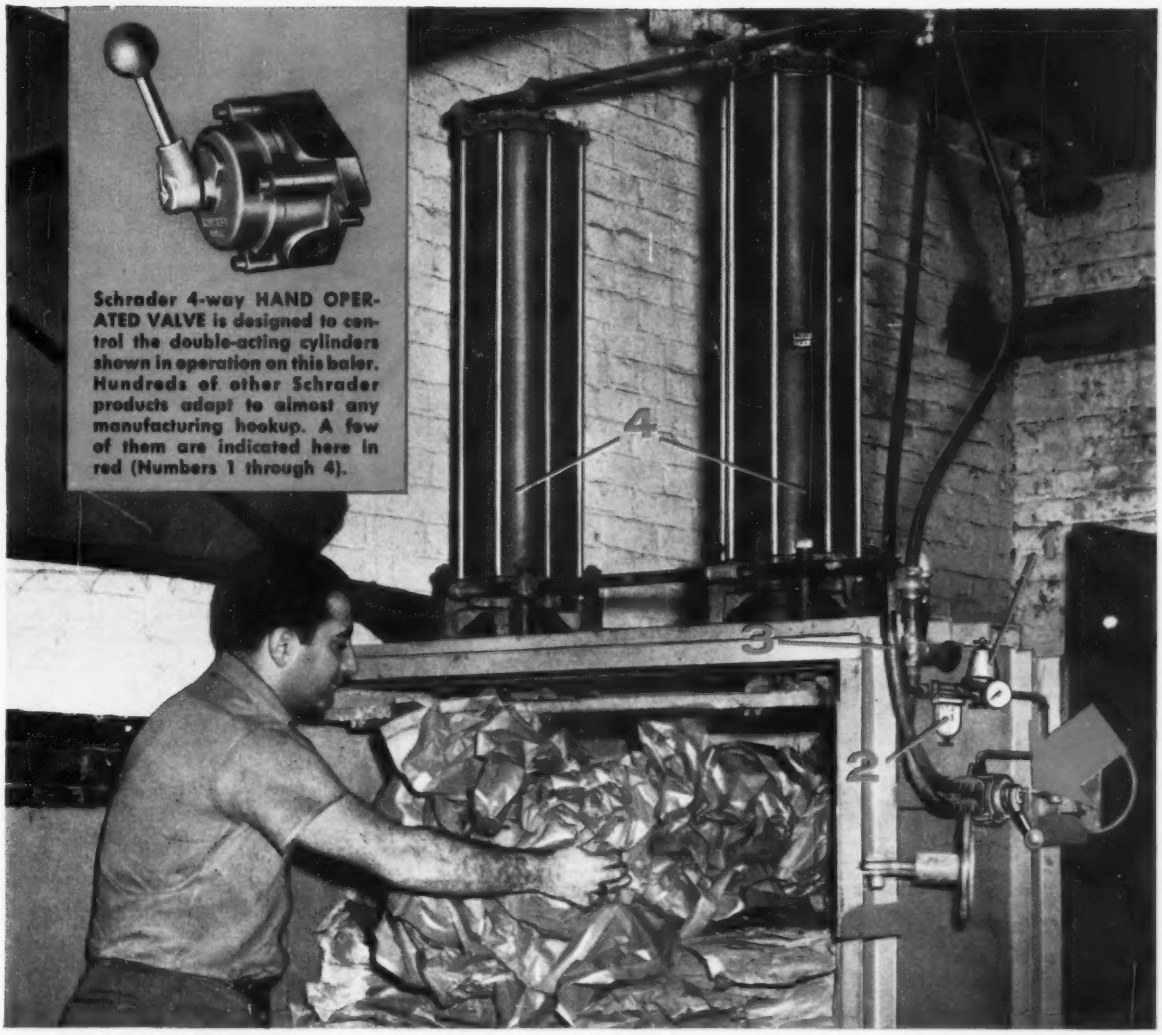
ALLOYS, Bearing
Bunting Brass & Bronze Co., 715 Spencer Toledo 1, Ohio.
Carpenter Steel Co., 105 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.
Mueller Brass Co., Port Huron, Mich.

ALLOYS, Non-ferrous—See Brass, Copper, Zinc and Stellite

ALUMINUM and Aluminum Products
Bridgeport Brass Co., Bridgeport, Conn.
Mueller Brass Co., Port Huron, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Ryerson & Son, Jos. T., 16th & Rockwell Sts., Chicago 8, Ill.

ANGLE PLATES—See Set-Up Equipment

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General Electric Co., Schenectady, N. Y.



Schrader 4-way HAND OPERATED VALVE is designed to control the double-acting cylinders shown in operation on this baler. Hundreds of other Schrader products adapt to almost any manufacturing hookup. A few of them are indicated here in red (Numbers 1 through 4).

How Schrader Air Products bale paper, producing 4 ton pressure with 100 lbs. of air

At this Rhode Island dye works, the paper baling operation formerly was a fatiguing manual chore. Now, the operator simply fills the press with used paper and cartons, and pulls a 4-way hand valve. One hundred pounds of air pressure flowing through the two Schrader double-acting cylinders then compress the paper with four tons of force. Finger-tip adjustments can reduce or raise pressure quickly, easily.

Safe, simple, fast – compressed air daily performs miracles in hundreds of different ways. More and more manufacturers think "air" when they think "automation." Holding work, moving scraps, synchronizing actions—all such operations can be automated with Schrader Air Products.

Air means economy, too. Upon request, Schrader engineers will assist you in planning for the most efficient use of air and in selecting the products best suited to your applications. Tell us your problems. We'll be glad to help. Or send for the latest informative booklets.

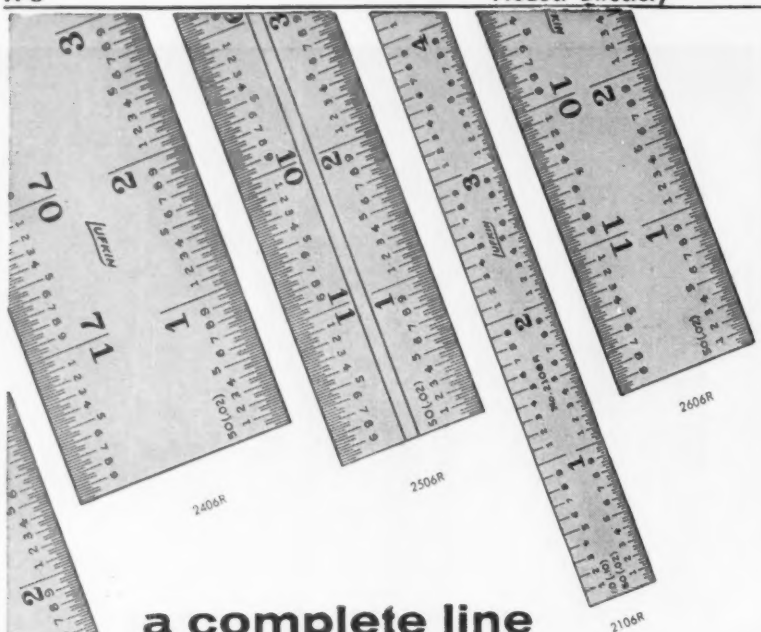


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ESTABLISHED IN 1844

A. SCHRADER'S SON
Division of SCOVILL
454 Vanderbilt Avenue, Brooklyn 38, N. Y.

FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

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a complete line of DECIMAL GRADUATED Steel Rules BY LUFKIN

You'll find exactly the decimal graduated rule you want in the complete line of Lufkin machine divided steel rules. Many models from narrow pattern to heavy spring tempered, including shrink rules and combination square blades. Lengths to 72 inches. Graduated 10ths and 50ths in accordance with latest "American Standards". Available plain or with Chrome Clad finish that wears longer, resists rust and stains and is easier to read.

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Cleveland Twist Drill Co., 1242 E. 49th St. Cleveland, Ohio.
Jacobs Mfg. Co., West Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis
Logansport Mch. Co., Inc., Logansport, Ind
South Bend Lathe Wks., South Bend 22, Ind
Supreme Products Inc., 2222 So. Calumet Ave. Chicago 16, Ill.
Wesson Co., 1220 Woodward Heights Blvd. Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd. Plymouth, Mich.

ARC WELDERS—See Welding Equipment, Arc

AUTOMATIC SCREW MACHINES—See Screw Machines, Single- and Multiple-Spindle Automatic

BABBITT

American Crucible Products Co., Lorain, Ohio
Ryerson, Jos. T. & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

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LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.
Sundstrand Mach. Tool Co., 2531 11th St., Rockford, Ill.

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Haynes Stellite Co., Kokomo, Ind.
New Departure Div., Bristol, Conn.

BAR MACHINES—See Screw Machines Single- and Multiple-Spindle, Automatic

BAR STOCK, Non-ferrous

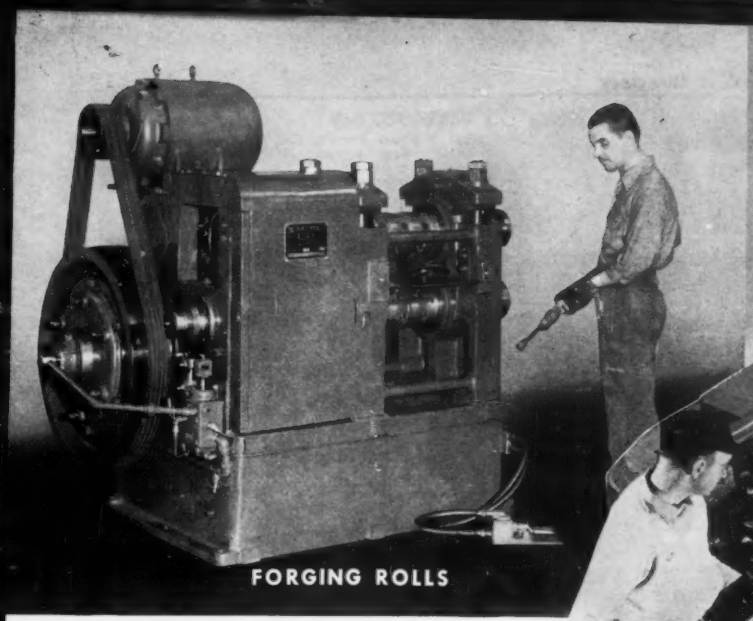
American Crucible Prod. Co., Port Huron, Mich.
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio.
Centrifugally Cast Products Div., Shenango Furnace Co., Dover, Ohio.
Mueller Brass Co., Port Huron, Mich.
Ryerson, Jos. T. & Son, 2558 W. 16th St., Chicago 18, Ill.

BAR STOCK AND SHAFTING, Steel

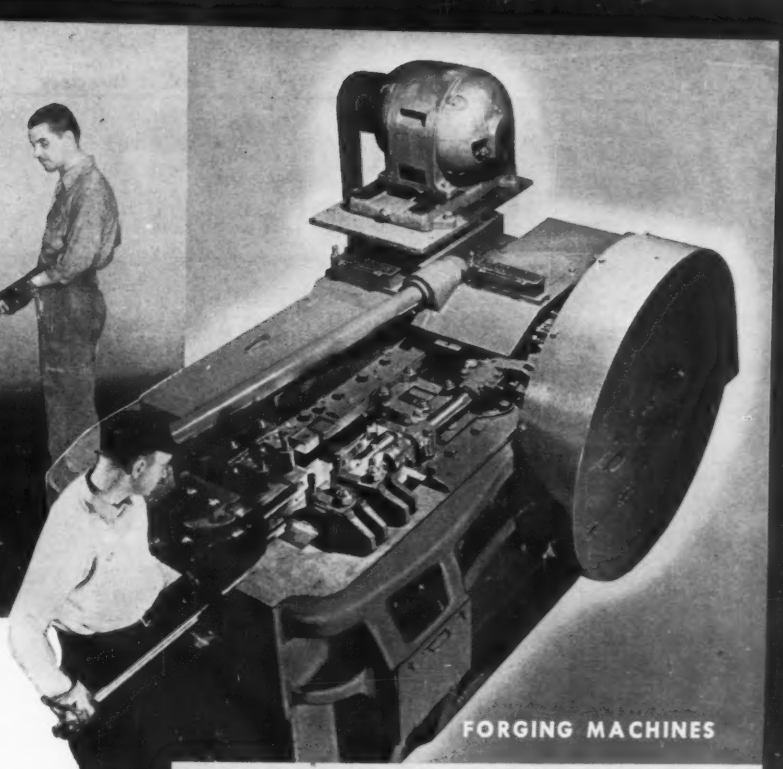
Bethlehem Steel Co., 701 East Third St. Bethlehem, Pa.
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Carpenter Steel Co., 105 W. Bern St., Reading Pa.
Crucible Steel Co. of America, Henry W Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa.
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Fafnir Bearing Co., New Britain, Conn



FORGING ROLLS



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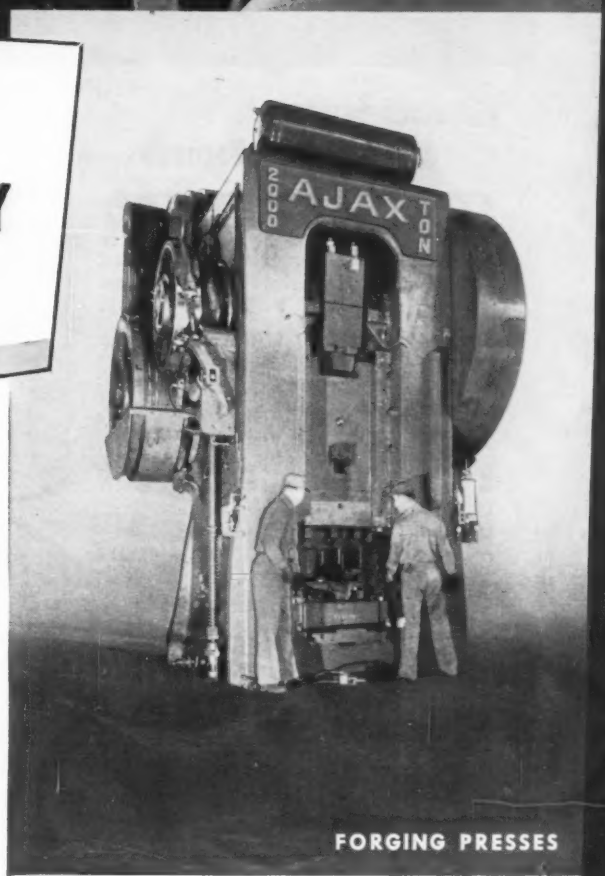
AJAX
FORGING MACHINERY
— Air Clutch Operated —
FOR
High Production

For speed in production . . . for accuracy of the forged part . . . and for capacity . . . AJAX provides a complete line of Forging Presses, Forging Machines, and Forging Rolls of the most advanced design ever offered to Industry.

Great rigidity, power and excellent alignment of these machines makes possible the production of uniformly accurate forgings with a minimum of machining.

Instantaneous response of the Air Clutch to the operator's control completes many multi-stage forgings in one heat and improves die life. Smooth, cushioned starting at high speed assures long machine life.

Write for descriptive bulletins



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AJAX METAL WORKING MACHINES

Forging Presses • Forging Machines • Forging Rolls

Ajax-Hogue Wire Drawers • Continuous Drawing & Straightening Machines

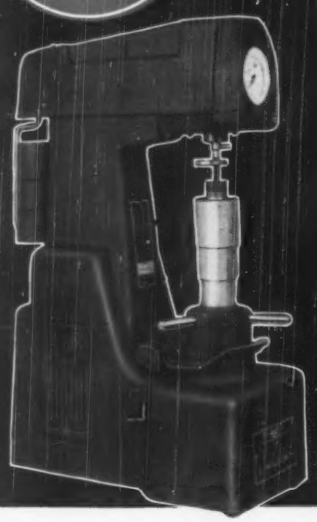
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Wilson "Rockwell"* Hardness Testers



Tests with INCREASED SPEED... Accurately

Y Model Motorized Hardness Tester

Requires fewer operating steps... *Because*

IT'S MOTORIZED

• Here is the motorized operating procedure made possible by the new WILSON "Rockwell" Y Model Motorized Hardness Tester—

1 Place specimen upon anvil or table.

2 Elevate test piece into test position. (With the new Set-O-Matic Dial Gauge, the large pointer will then automatically point to zero.)

3 Tap depressor bar to apply Major Load. When Major Load is fully applied, the Motorized Mechanism takes over—completes the test cycle—removes the Major Load.

4 Read "Rockwell" Hardness Number. Then, lower elevating screw to remove test piece.

For complete information about the WILSON Y Model, or any others of the complete line of WILSON "Rockwell" Hardness Testers, write or call today. A WILSON hardness testing expert is available to consult on your specific requirement. **Trade mark registered*



Illuminated Dial Gauge

(1) Affords clear and easy reading. Readings are easily taken wherever your "Rockwell" Tester is located—whatever the lighting conditions of the room.

Indenter light (2) is directed towards the test area, making it easy to locate the exact area of test at all times.



Set-O-Matic Dial Gauge

The Set-O-Matic Dial Gauge increases the accuracy of the test, makes the test cycle shorter and increases the number of readings obtainable within a definite period of time.

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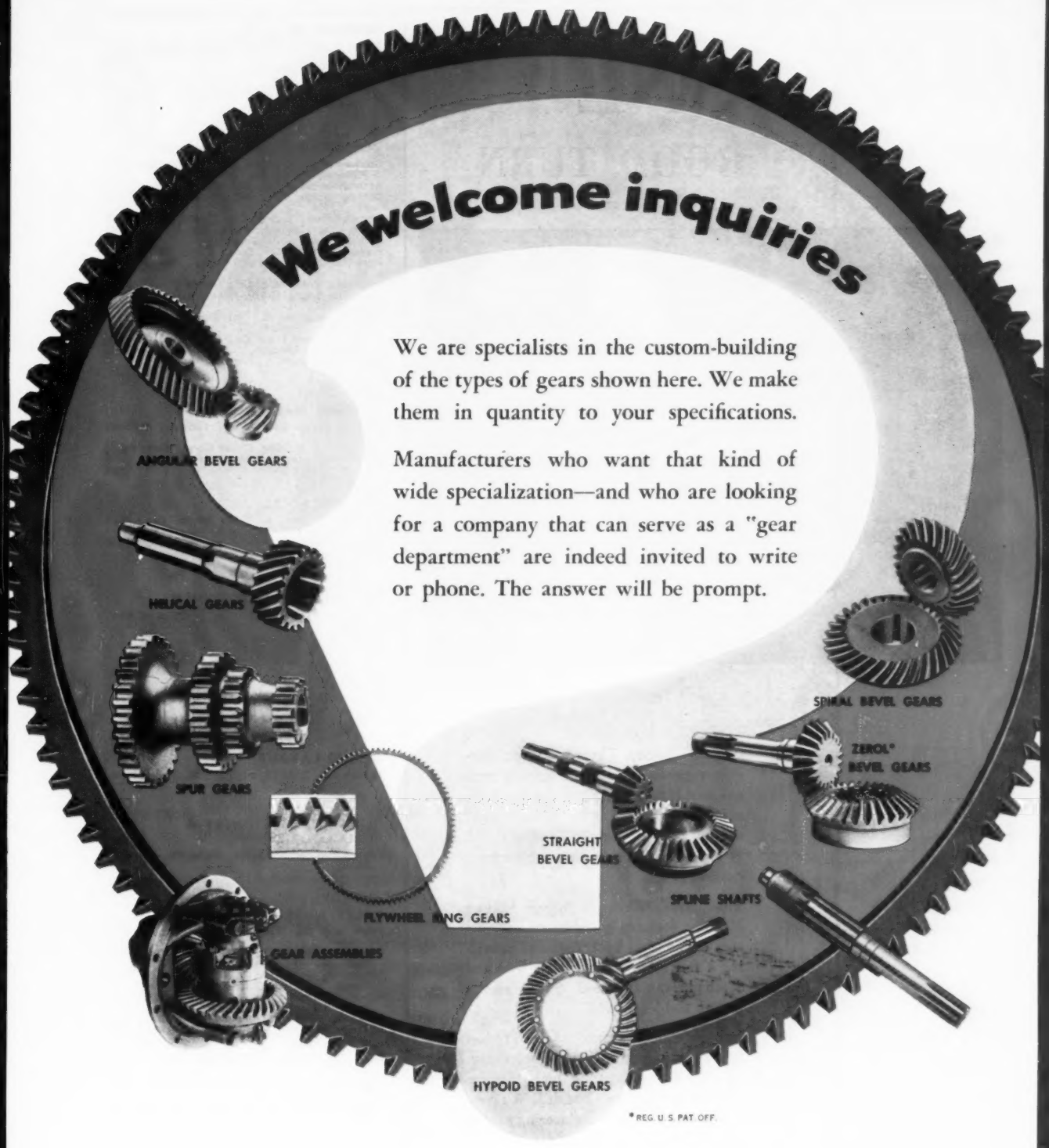
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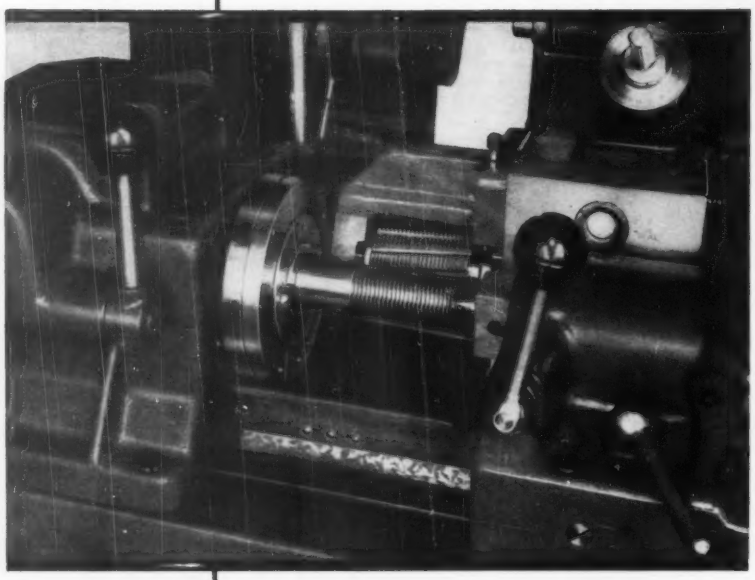
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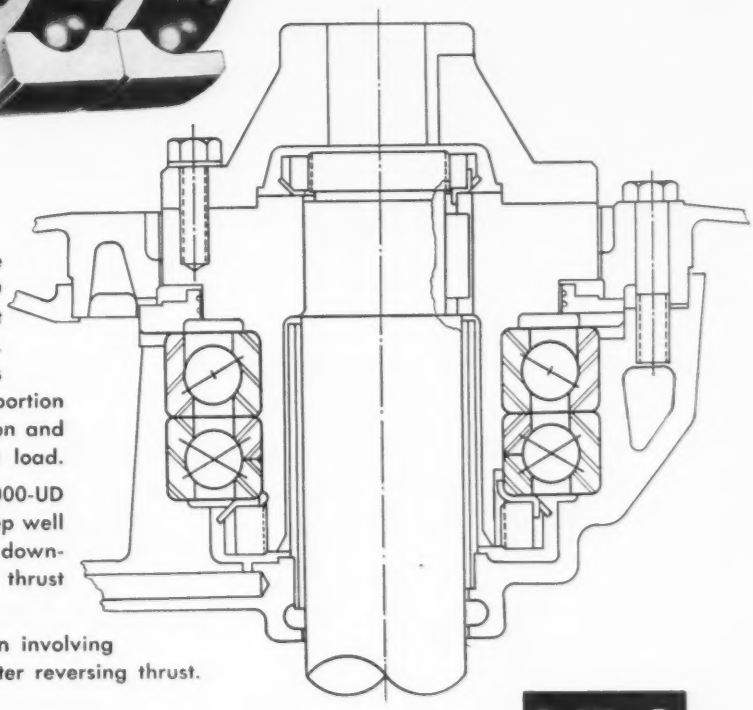
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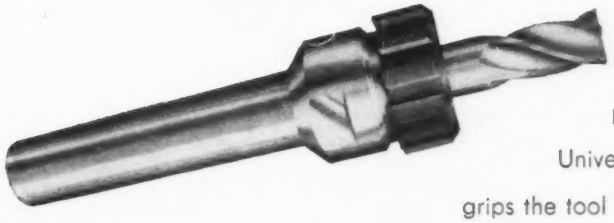
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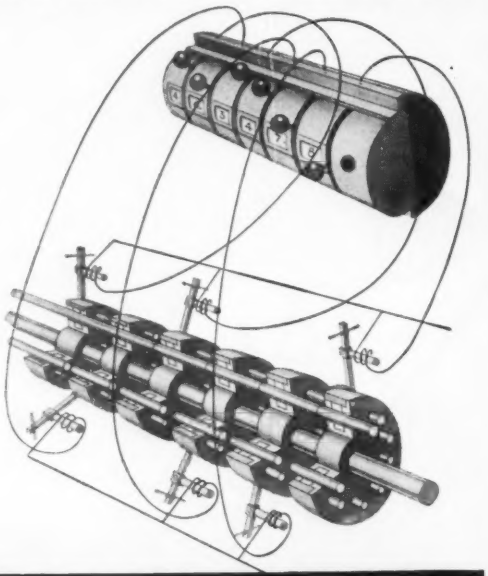
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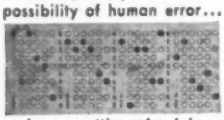
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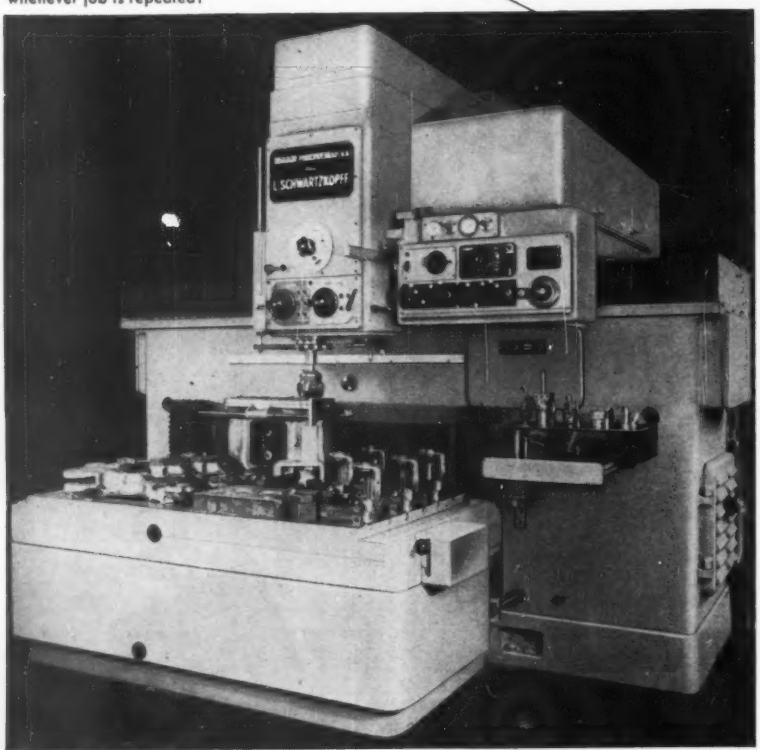


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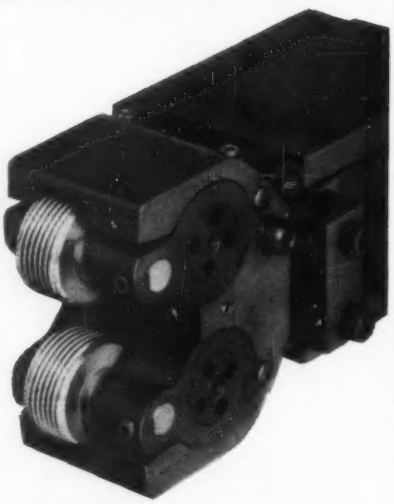
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Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio.
Universal Engrg. Co., Frankenmuth, Mich.

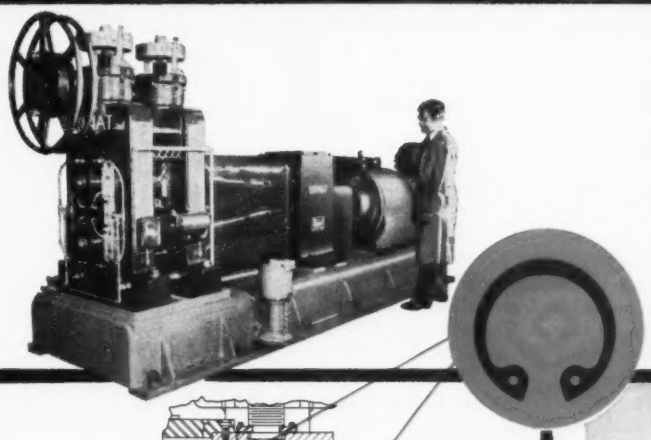
BUSHINGS, Hardened Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Universal Engrg. Co., Frankenmuth, Mich.

BUSHINGS, Non-ferrous and Powdered Metal

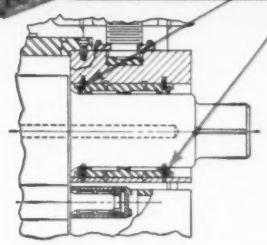
American Crucible Products Co., Lorain, Ohio.
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio.
Universal Engrg. Co., Frankenmuth, Mich.

7-inch Waldes Truarc retaining rings cut costs, speed assembly-disassembly of 2-high/4-high mill

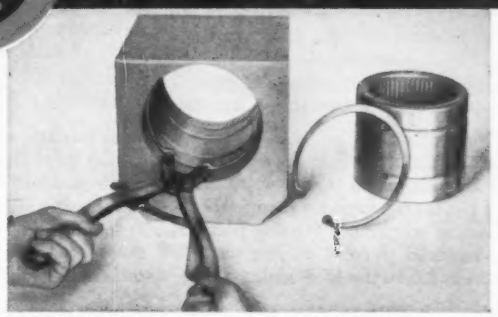


New Model TA-625 2-high/4-high combination rolling mill designed by Stanat Manufacturing Co., Long Island City, N. Y., reduces 2½" ingot to precision-rolled strip as thin as .001".

Waldes Truarc retaining rings help make possible a complete change of work rolls in 20 minutes...solve difficult problems of accuracy control by achieving positive location of bearings to extremely close tolerances. Rings eliminate costly parts and machining, save space, reduce maintenance.



In the assembly illustrated above, 7" Waldes Truarc (Series 5000) retaining rings—three on each roller—are used to position heavy-duty needle bearings in the bearing housing. Smaller rings position bearings in other roller assemblies and retain the shaft of a dual handwheel screwdown. All in all, 18 Waldes Truarc rings are used in the mill. They replace machined shoulders, spacers and lock nuts...eliminate costly threading, other machining operations.



Assembly is simple, even with giant 7" diameter Truarc ring. Special Truarc ratchet pliers grasp the ring securely, ease it into the groove, snap it securely into position. Smaller pliers and various high-speed assembly jigs are available for other rings, permit assembly-disassembly to be performed rapidly even by unskilled labor.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. Quick and easy to assemble and disassemble, they do a better job of holding parts together. Truarc rings are precision-engineered and precision-made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



WALDES TRUARC® RETAINING RINGS

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M-02®

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For more information fill in page number on Inquiry Card, on page 239

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

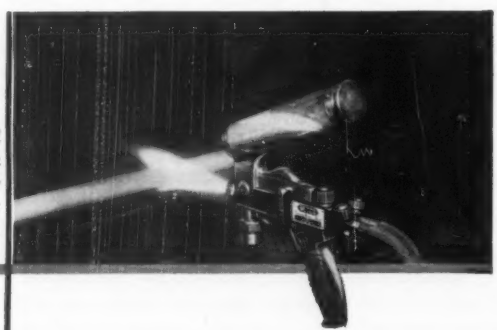
Development of the new METCO THERMOSPRAY GUN for spraying high-melting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

Another THERMOSPRAY Powder – 201 – is zirconia which is somewhat softer than No. 101 but provides superior heat-insulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The free-flowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour—.010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course.



Pump rod sprayed with alumina provides superior protection against abrasion and corrosion.



free bulletins
(See last paragraph above)

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1131 Prospect Ave., Westbury, L. I., New York

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☐ free Bulletin 126 (hard-facing).

Name

Title Company

Address

City Zone State

CABINETS, Tool
Brown & Sharpe Mfg. Co., Providence, R. I.
Standard Pressed Steel Co., Jenkintown, Pa.

CALIPERS, Spring, Firm-Joint, Transfer, Termaphrodite, etc.—See Layout and Drafting Tools; Machinists' Small Tools

CALIPERS, Vernier
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., Des Plaines, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12 N. Y.
Starrett, The L. S. Co., Athol, Mass.

CAM CUTTING MACHINES
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio.
Pratt & Whitney Co., Inc., West Hartford, Conn.
Russell Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

CAM MILLING AND GRINDING MACHINES
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

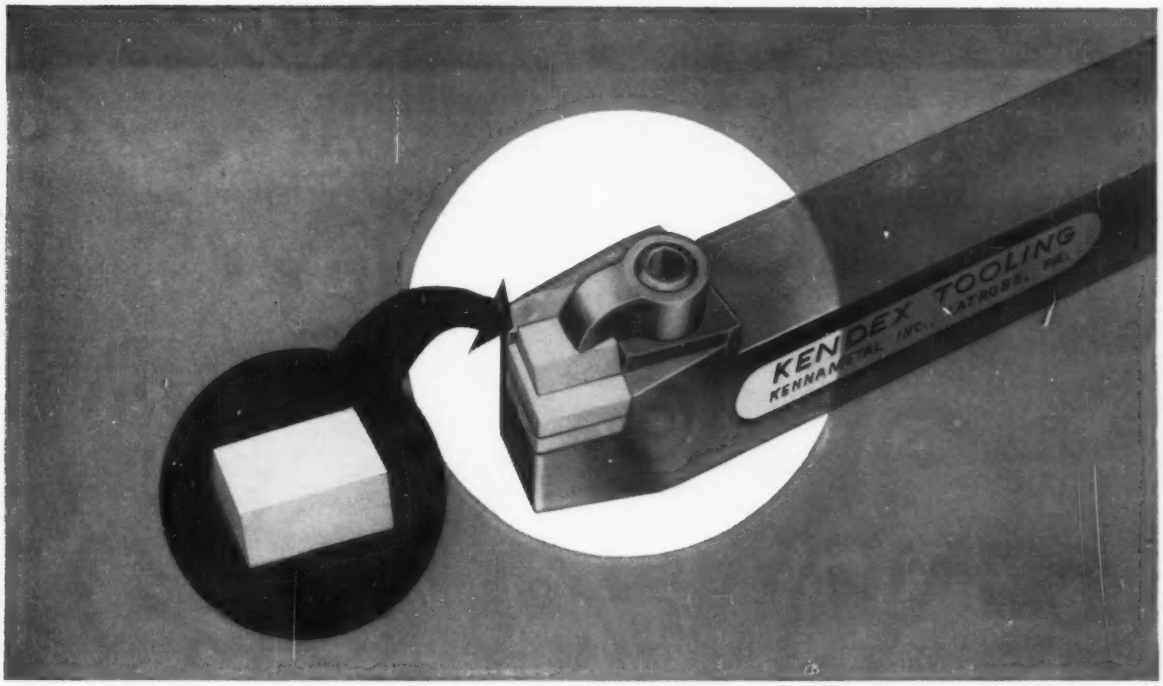
CAMS
Brown & Sharpe Mfg. Co., Providence, R. I.
Eisler Engrg. Co., Inc., 750 S. 13th, Newark 3, N. J.
Hartford Special Machinery Co., 287 Homestead St., Hartford Conn.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Besley-Wells Corp., 112 Dearborn Ave., South Beloit, Ill.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago 10, Ill.
DoAll Co., Des Plaines, Ill.
Kennametal, Inc., Latrobe, Pa.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CASTINGS, Die
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Non-ferrous
American Crucible Products Co., Lorain, Ohio.
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa
Centrifugally Cast Products Div.—Shenango Furnace Co., Denver, Ohio.
Dow Chemical Co., Midland, Mich.
Mueller Brass Co., Port Huron 35, Mich.
Vascoloy-Ramet Corp. North Chicago, Ill.

CASTINGS, Gray Iron, Malleable
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Centrifugally Cast Products Div.—Shenango Furnace Co., Dover, Ohio.
Challenge Mchry. Co., Grand Haven, Mich.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.



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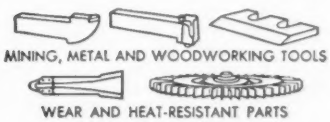
5. Complete line of Chipbreakers for Kendex tools available in two types: (a) for general purpose machining, and (b) for light feeds.

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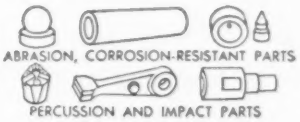


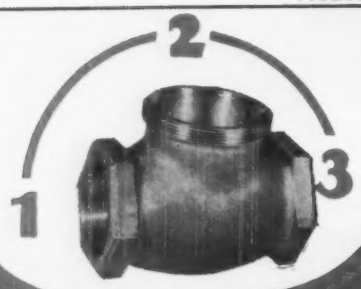
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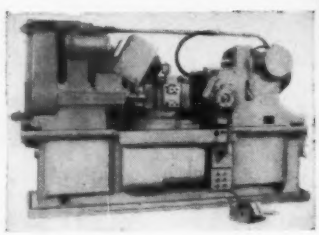


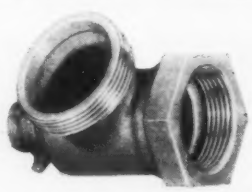
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

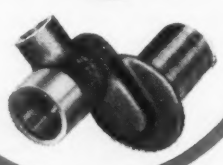
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A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

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Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Crucible Steel Co. of America, Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.

CEMENT, Abrasive Disc
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTER-DRILLING MACHINES
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
La Salle Tool Inc., 3840 E. Outer Dr., Detroit 34, Mich.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

CENTER PUNCHES — See Machinists' Small Tools

CENTERS, Grinding Machines, Indexing Head and Lathe
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Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit, Mich.
Scully Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
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CERAMIC TOOL MATERIAL—See Tool Material, Ceramic

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CHUCKING MACHINES, Single-Spindle Automatic
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Coulter, James Mch. Co., 629 Railroad Ave., Bridgeport 5, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch Co., Springfield, Vt.
National Acme Co., 170 E. 131st St., Cleveland, Ohio
Potter and Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
Russell Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio

CHUCKING MACHINES, Multiple-Spindle Automatic
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Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
National Acme Co., 170 E. 131st St., Cleveland, Ohio
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
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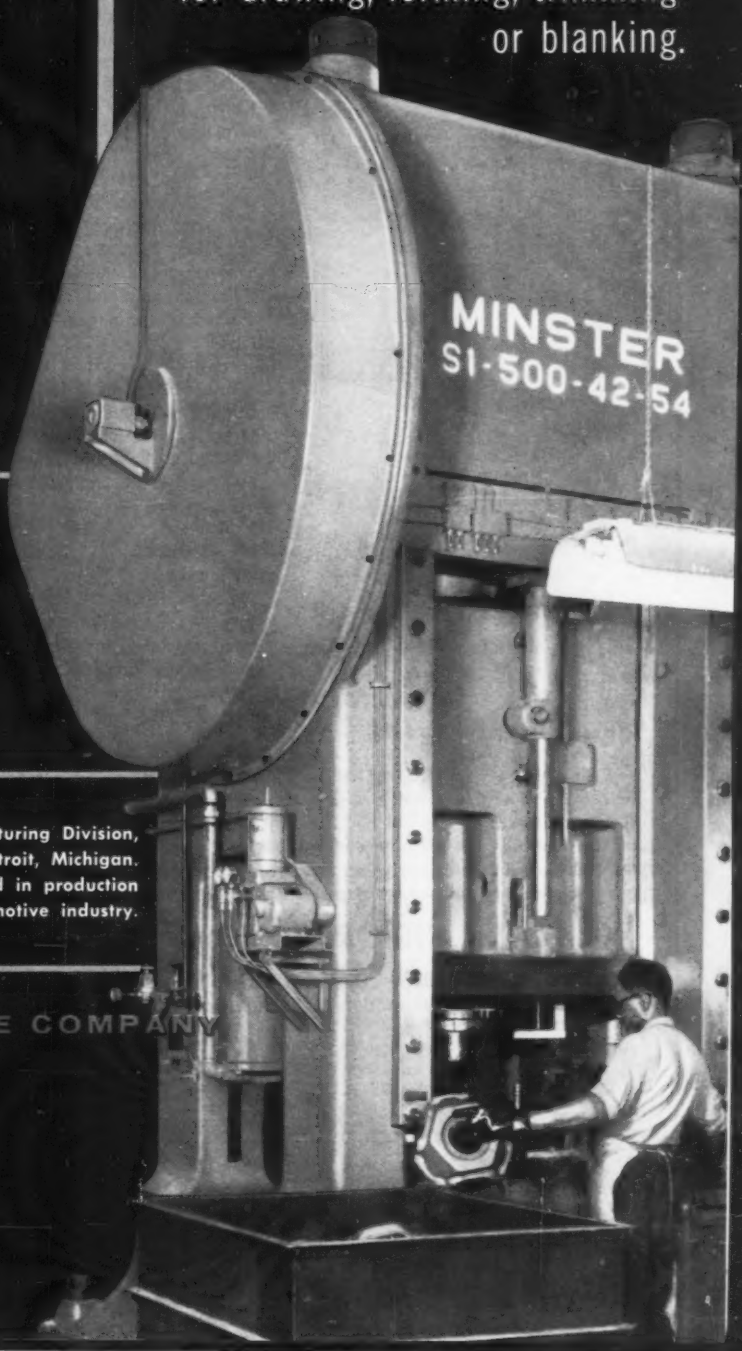


Photo courtesy of Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan. Minster S1-500 Press used in production of clutch coverplates for the automotive industry.

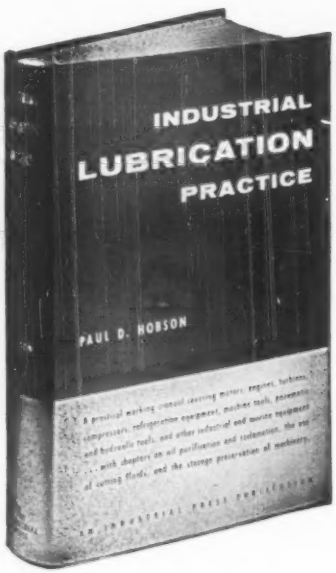
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Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio
Wickes Brothers, 512 No. Water St., Saginaw, Mich.

CHUCKS, Air Operated

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

CHUCKS, Collet

Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.
Chicago Tool & Engrg. Co., 8389 So. Chicago Ave., Chicago, Ill.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Cushman Chuck Co., 800 Windsor St., Hartford 2, Conn.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mech. Lab. Inc., 24 Norwood Ave., Staten Island 4, N. Y.
Gisholt Mch. Co. 1245 E. Washington Ave., Madison 10, Wis.
Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jacobs Mfg. Co., West Hartford 10, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engrg. Co., Frankenmuth 2, Mich.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio

CHUCKS, Combination Universal-Independent

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Horton Chuck, Windsor Locks, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio
Skinner Chuck Co., 95 Edgwood Ave., New Britain, Conn.

CHUCKS, Compensating

Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Diaphragm

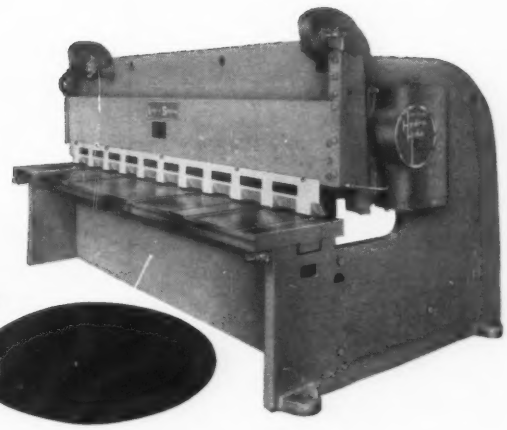
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.
Wadell Equip. Co., Terminal Ave., Clark, N. J

CHUCKS, Drill, Key Type

Delta Power Tool Div., 400 Lexington Ave. Pittsburgh 8, Pa.
Jacobs Mfg. Co., West Hartford, Conn.
Supreme Products, Inc., 2222 So. Calumet Ave., Chicago 16, Ill.

CHUCKS, Drill, Keyless

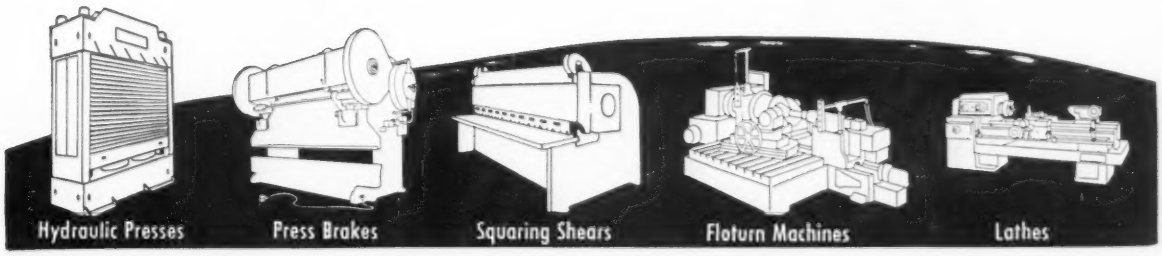
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.
Jacobs Mfg. Co., West Hartford, Conn.
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
Supreme Products, Inc., 2222 So Calumet Ave., Chicago 16, Ill.



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There are, of course, many other productioneered features in the New Lodge & Shipley Shears. For details, write for Bulletin PS-8:
The Lodge & Shipley Co., 3057 Colerain Ave., Cincinnati 25, Ohio



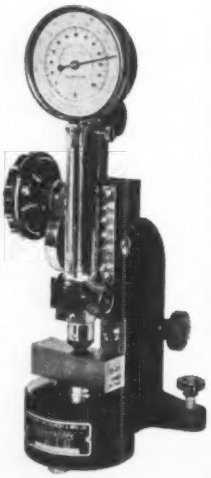
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"SHORE for SURE"
HARDNESS TESTING



Shore's Improved Direct Reading Scleroscope (above) and Standard Recording Scleroscope (below) with dial graduated in standard Scleroscope and equivalent Brinell and Rockwell "C" Hardness Numbers, are able to perform over 1000 hardness tests per hour. Both Scleroscopes are completely portable, operative on all types and sizes of metals, are reliable in hands of non-technical help, and show no visible injury signs on finished surfaces. Write for free brochures on these instruments.

Direct Reading Scleroscope shown above with special Swing Arm & Post Assembly. Height capacity 9", reach 14". To be mounted on bench for testing large objects. Supplied with two test blocks and diamond hammer.



Standard Recording Scleroscope (right) with Clamping Stand, jaw capacity 3" high x 2½" deep. Supplied with following accessories: diamond hammer, hard and soft test block, V block for testing rounds, and steel carrying case.

THE SHORE INSTRUMENT and MANUFACTURING Co., Inc.
90-35 Van Wyck Expressway, Jamaica 35, N. Y.

CHUCKS, Full Floating
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Gear
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Horton Chuck, Windsor Locks, Conn.
Supreme Products, Inc., 2222 So. Calumet Ave., Chicago, Ill.

CHUCKS, Independent
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Homestrand, Inc., Larchmont, N. Y.
Horton Chuck, Windsor Locks, Conn.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Lathes, etc.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Chicago Tool & Eng. Co., 8389 So. Chicago Ave., Chicago, Illinois (Milling Machine)
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Horton Chuck, Windsor Locks, Conn.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

CHUCKS, Magnetic
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Quick Change and Safety
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Chicago Tool & Engrg. Co., 8389 So. Chicago Ave., Chicago, Ill.
Jacobs Mfg. Co., West Hartford 10, Conn.
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.



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Philadelphia



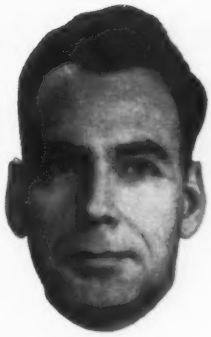
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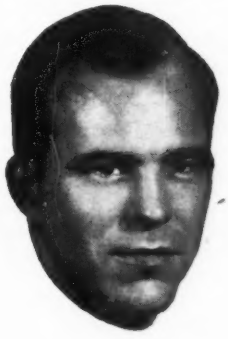


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Chicago

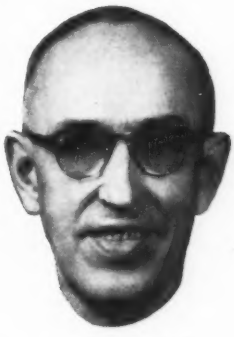


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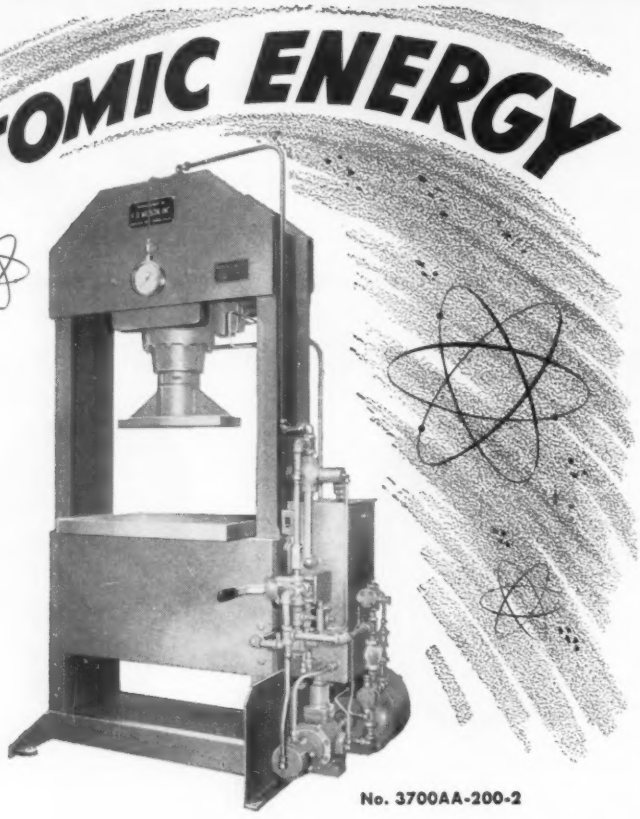
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No. 3700AA-200-2

DRAMATIC EXAMPLE OF PRESS PROGRESS BY WILSON

Zirconium! . . . in this single word lies a story of remarkable press progress at K. R. Wilson. A press was needed for cutting and pressing zirconium, glistening metal vitally important in the construction of nuclear reactors for atomic energy. The problem was put to Wilson engineers. *The challenge was accepted and a press was built to do the job!* The K. R. Wilson 3700AA-200-2 200-Ton Capacity Motor Driven Hydraulic Press combines all the features necessary to cut and press zirconium with maximum efficiency and economy. The 3700AA-200-2 is but one of scores of examples of the years-ahead technical thinking that makes any type of Wilson press your wisest buy.

CONSIDER THE FEATURES AND YOU'LL CHOOSE WILSON
MODEL No. 3700AA-200-2

HEAVY DUTY RAM 6" diameter heat treated and ground alloy steel ram. 10" bore. 18" stroke.

DOUBLE ACTING CYLINDER Provides power on upstroke for stripping and to offset weight of tooling.

COMPLETE RAM CONTROL Stops in any position; allows you to raise just enough to clear work.

GUIDED RAM Non-rotating ram completely eliminates ram turning.

SIDE-MOUNTED HYDRAULIC UNIT Requires minimum amount of floor space; easily accessible for service.

RAM SPEEDS Rapid Idle Approach Speed to 23 tons, 52" per minute. Pressing Speed to 200 Tons, 8¾" per minute. Rapid Idle Return to 15 Tons, 75" per minute.

FOR FULL DETAILS WRITE FOR BULLETIN No. 37

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K. R. WILSON, Inc.
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Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.
Gisholt Mch. Co., Madison 10, Wis.
Homestrand, Inc., Larchmont, N. Y.
Horton Chuck, Windsor Locks, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio

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Gisholt Mch. Co., Madison 10, Wis.

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Oakite Products, Inc., 19 Rector St., New York, N. Y.

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Fawick Corp., Cleveland, Ohio
Minster Mch. Co., Minster, Ohio
Rockford Clutch Div., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

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COMBINATION SQUARES—See Machinists' Small Tools

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Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, L. S., Co., Athol, Mass.

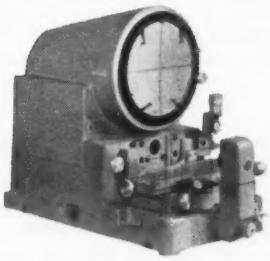
COMPARATORS, Optical
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Eastman Kodak Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning—See Cleaners, Metal

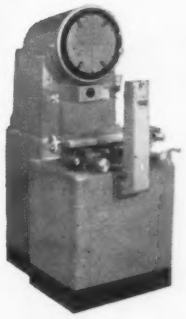
COMPOUNDS, Cutting, Grinding, Metal Drawing, etc.—See Cutting and Grinding Fluids

COMPRESSORS, Air
Chicago Pneumatic Tool Co., New York 17, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

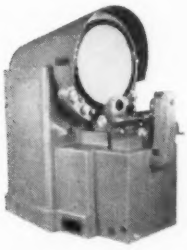
Speed production with projection gaging . . . and the *right* KODAK CONTOUR PROJECTOR



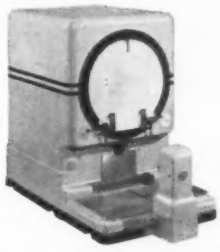
Model 14-2A—Do you need a versatile precision measuring instrument for toolroom or production lines? Kodak Model 14-2A measures intricate parts to the order of .0001", lets you do routine gaging by comparing the part with a chart. Measuring attachment is equipped with micrometer guaranteed accurate to .00005" over the entire 1" range. Dial indicator ends need for micrometer feel. Kodak Measuring Blocks, in standard dimensions, can be inserted in the horizontal and vertical micrometers to cover full travel range. Has 14-inch screen. *You can use any Kodak Contour Projector anywhere in normal light.*



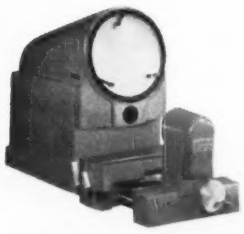
Model 14-5—Are the parts you have to inspect heavy? Model 14-5, optically the same as Model 14-2A, comes with an extra-large, heavy-duty worktable; its box-like construction withstands great weight without measurable deviation. Model 14-5 has the same measuring range as the Model 30, with 8 inches of table travel in both horizontal and vertical planes. *Optical inspection requires little training, and Kodak Contour Projectors are designed with the operator's convenience in mind.*



Model 30—A heavy-duty worktable plus a 30-inch screen makes this the model for toolroom or production inspection of large parts. Table traverse is 8" in both horizontal and vertical planes, focusing travel totals 3". Engraved dial, calibrated to 2' of arc, permits angular measurement reading directly, without need of vernier. *The versatility of optical inspection and the adaptability of Kodak Contour Projectors let you do many measurement tasks with one unit.*



Model 3—Check long runs quickly and accurately with this low-cost instrument. Designed for use with your own staging fixtures, Model 3 comes with flat stationary table. Adjustable chart holder permits "set lines" on ground-glass overlay chart to be brought to coincidence with "set surfaces" of the fixture, avoiding need for table movement. *Seemingly impossible-to-measure shoulders, holes, angles, and relationships are easily gaged on Kodak Contour Projectors.*



Model 8—Inspect horizontally and vertically, anywhere in your plant with Model 8. Take this cast-aluminum unit wherever there's need for fast, accurate inspection of small parts. For horizontal inspection, simply stage the part in a simple holding fixture. For vertical measuring, turn Model 8 on end and stage the part on a flat glass stage. Part image on the 8-inch screen is erect and unreversed both ways. Six magnifications from 10× to 100×. *Kodak Contour Projectors have rugged housings to more than withstand conditions of normal use.*



Eliminate receiving inspection bottlenecks, avoid waste on reject parts, predict tool failure before it occurs, speed inspection to match production, make final measurements. Which of these Kodak Contour Projectors will solve your production problem?

How to learn more about Kodak Contour Projectors

From the Kodak Ektar Lens system, (heart of Kodak Contour Projectors), to the precision machining of critical parts, these units are built to meet your most rigid requirements.

To the basic Projector, you can add a number of optional staging and measuring attachments. Your Kodak Representative will be glad to describe these to you and explain their uses.

For the name of our representative or for a descriptive catalog on Kodak Contour Projectors, write to Special Products Sales Division, Eastman Kodak Company, Rochester 4, N. Y.

EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the
KODAK
CONTOUR
PROJECTOR

Kodak
TRADEMARK

INEXPENSIVE—HIGHLY EFFICIENT

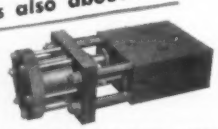


UNEQUALED FOR ⅛" AND ¼" SERVICE

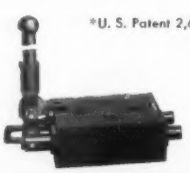
• These valves combine utmost simplicity, low price and rugged, efficient, dependable construction. Valve chambers* are formed by aluminum spacers held tightly in metal to metal end abutment assuring accurate positioning of the "O" rings on both inside and outside diameters without mechanical pressure. The flow is from the inlet chamber through the hollow radially ported ground and polished stainless steel plunger, and out through other ports in the plunger to the connected line. No direct impingement of flow across the packings. No lapped joints. No metal to metal seating. Sub-base permits ⅛" or ¼" pipe connections into either side or bottom. Easily serviced in the field. Write for fully descriptive bulletin.

*U. S. Patent 2,645,450

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AIR AND HYDRAULIC
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CONTOUR FOLLOWER—See Tracing Attachments

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Erie Foundry Co., Erie, Pa.
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
Lake Erie Engrg. Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Michigan Drill Head Co., Van Dyke, Mich.
National Acme Co., 170 E. 131st St., Cleveland, Ohio
Van Keuren Co., Watertown, Mass.

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Allen-Bradley Co., 1331 S. 1st St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co. Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

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Indiana Commercial Filters Corp., 28 South Ave., Lebanon, Ind.

COPPER

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

COUNTERBORES AND COUNTERSINKS

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
DoAll Co., Des Plaines, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Mich.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Heller Tool Co., Newcomerstown, Ohio
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mass.

COUNTERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.

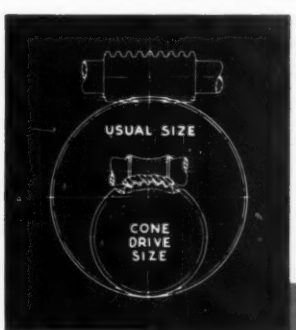
COUPLINGS

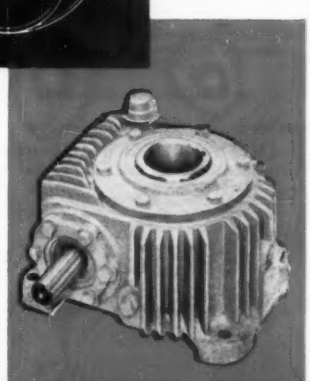
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Mueller Brass Co., Port Huron, Mich.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Schrader's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa. (Shaft)
Thor Power Tool Co., 175 N. State St., Aurora, Ill.
Twin Disc Clutch Co., Racine, Wis.
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For more information fill in page number on Inquiry Card, on page 239

for concentrated power







. . . CONE-DRIVE gearing has no equal.

You can pass an amazing amount of power through a set of Cone-Drive gears.

Want to cut product size? Cone-Drive will give you a more compact gear train with reserve load capacity.

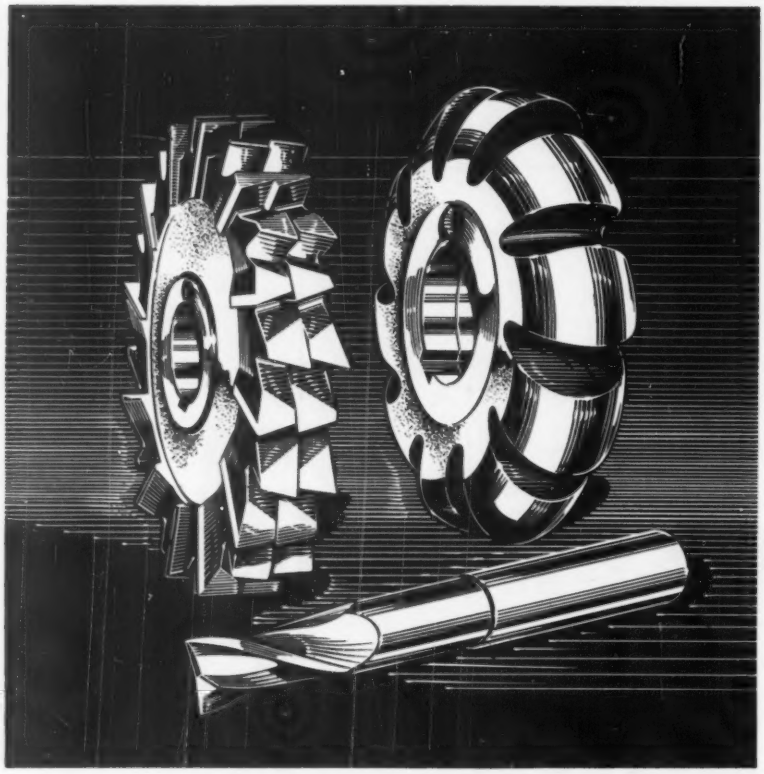
Want to boost power output and hold size? That's easy with Cone-Drive gears. They'll carry two, three, and four times the load of cylindrical worm gearing.

Why? In Cone-Drive gears, the load isn't concentrated on a small area per tooth or on just one or two teeth at a time. Cone-Drive's exclusive double-enveloping principle distributes the load over a lot of teeth and over more area on each tooth.

It cuts the unit loading the same way a pair of snowshoes supports a heavy man.

Ask for Bulletin CD-400 for complete details.

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DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS
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Are solid high-speed steel milling cutters obsolete?

If they are someone ought to tell our customers about it. They've asked us to produce so many styles and sizes that we finally went all the way and stock the most complete line available anywhere.

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Even though Go & Go produces a lot of inserted blade cutters, we're just as proud of our extensive line of solid high-speed steel cutters. Every tool is engineered with the same care and over 38 years of milling cutter know-how goes into each and every one.

Want to see the extensive stock of standards available? Ask for Catalog F, it's free on request. Go & Go also designs and manufactures special milling cutters in quantity. Check one of our engineering sales representatives in principal industrial centers for details.

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Engineering and producing tools that Go & Go since 1917.

CRANES, Electric Traveling
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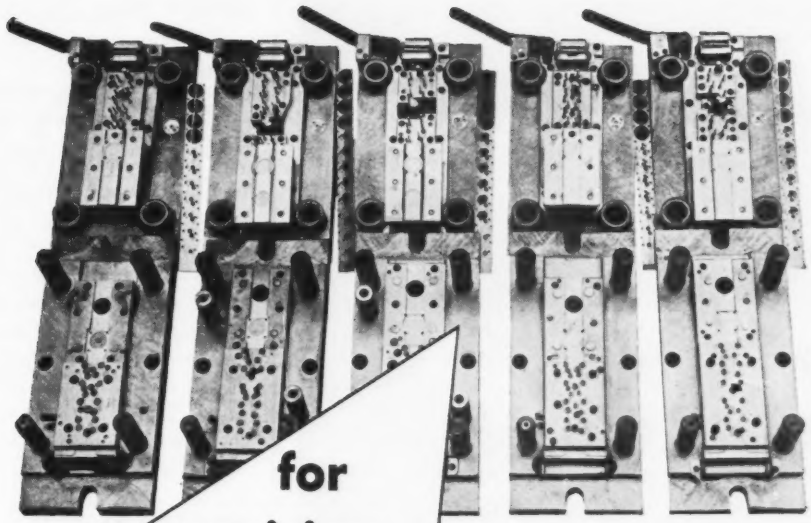
CUTTERS, Keyseating
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio
Davis Keyseater Co., 405 Exchange St. Rochester 8, N. Y.
DoAll Co., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Mitts & Merrill, 1009 So. Water St., Saginaw, Mich.
National Twist Drill Co., Rochester, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling
Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
DoAll Co., Des Plaines, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Goddard & Goddard Co., Detroit, Mich.
Garton, George, Mch. Co., 1321 Racine St. Racine, Wis.
Hanson-Whitney Co., 169 Bartholomew Ave. Hartford 3, Conn.
Haynes Stellite Co., Kokomo, Ind.
Ingersoll Milling Mch. Co., 2442 Douglas St. Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio
National Twist Drill & Tl. Co., Rochester, Mich
Tomkins-Johnson Co., Jackson, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

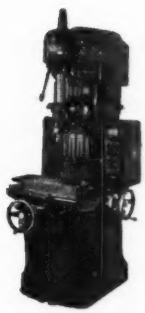
CUTTING AND GRINDING FLUIDS
Cincinnati Milling Products Div., Cincinnati, Ohio
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., Des Plaines, Ill.
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Motch & Merryweather Mchy. Co., Penton Bldg., Cleveland 3, Ohio
Oakite Products, Inc., 26 Rector St., New York 6, N. Y.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York, N. Y.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y

CUTTING-OFF MACHINES, Lathe Type
Bardons & Oliver, Inc., 1133 West Ninth St., Cleveland 13, Ohio
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Cone Automatic Mch. Co., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Grieder Industries, Inc., Bowling Green, Ohio
Modern Machine Tool Co., Jackson, Mich.

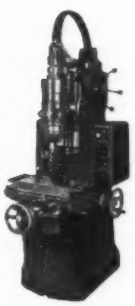
CUTTING-OFF SAWS, Abrasive Wheel
Delta Power Tool Div., 400 N. Lexington Ave. Pittsburgh, Pa.
DoAll Co., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
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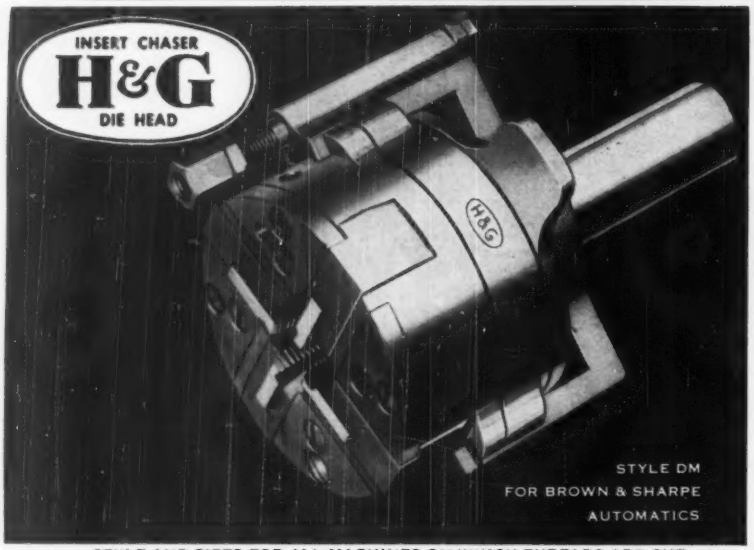
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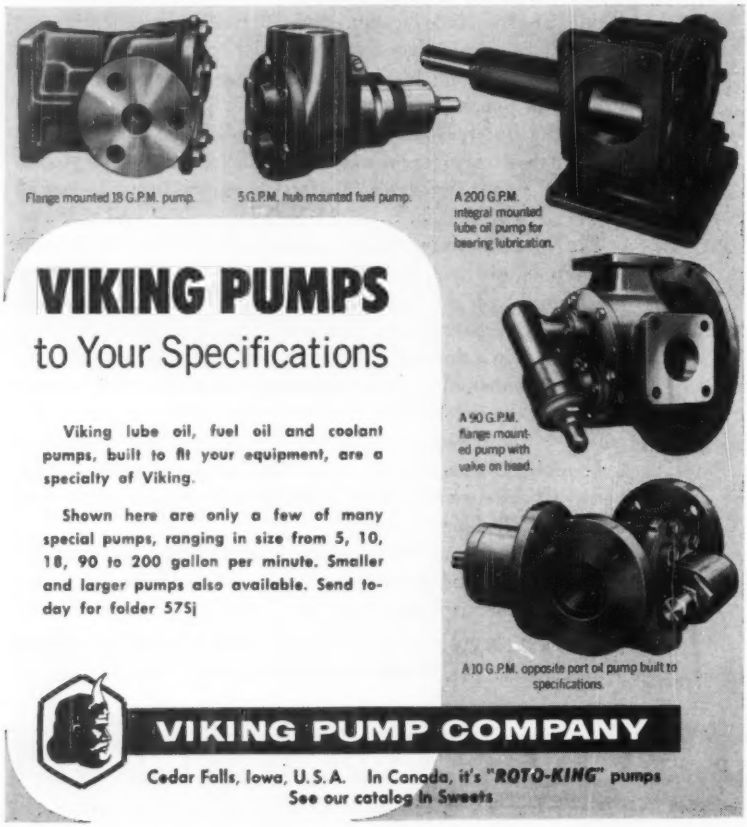
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Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
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Vickers, Inc., Detroit 32, Mich.
Wilson, K. R., Inc., Arcade, N. Y.

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Sheffield Corp., Box 893, Dayton 1, Ohio
Sunnen Products Co., 7910 Manchester, St. Louis 17, Mo.

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Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo, N. Y.

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Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
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Minster Mch. Co., Minster, Ohio
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

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Vascoloy-Ramet Corp. North Chicago, Ill.

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Producto Mch. Co., 985 Housatonic Ave., Bridgeport 1, Conn.
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Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Olofsson Corp., Lansing, Mich.
Ryerson & Son, Inc., Jos. T., 16th & Rockwell Sts., Chicago 8, Ill.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
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Eastern Mch. Screw Corp., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio

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National Acme Co., 170 E. 131st St., Cleveland 8, Ohio
Pratt & Whitney Co., Inc., West Hartford, Conn.
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DIES, Wire Drawing

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Standard Pressed Steel Co., Jenkintown, Pa.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
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Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
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Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
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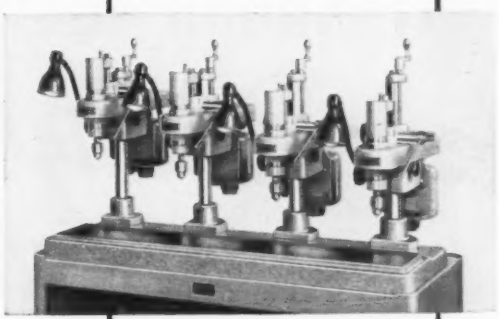
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DoAll Co., Des Plaines, Ill.
Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.
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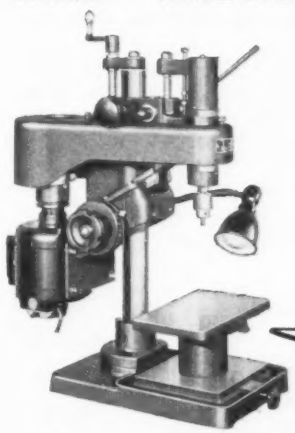
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Baush Machine Tool Co., 15 Watson Ave., Springfield, Mass.
Buffalo Forge Co., Broadway, Buffalo, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
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Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn, N. Y.
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee 14, Wis.
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.
Leland Gifford Co., Box 989, Worcester 1, Mass.
Michigan Drill Head Co., Van Dyke, Mich.
National Automatic Tool Co., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
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Zagar, Inc., 2400 Lakeland Blvd., Cleveland 23, Ohio

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Michigan Drill Head Co., Detroit 34, Mich.
Milholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
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Snow Manufacturing Co., Bellwood, Illinois

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Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
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Govro-Nelson Co., 1931 Antoinette St., Detroit 8, Mich.
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LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.
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Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
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National Automatic Tool Co., S. 7th and N. Sts., Richmond, Ind.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
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Western Machine Tool Works, Holland, Mich.
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Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Edlund Mchry. Co. Div., Cortland, N. Y.
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Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
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Michigan Drill Head Co., Van Dyke, Mich.
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Moline Tool Co., Moline, Ill.
Morris Machine Tool Co., Inc., 933 Harriet Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Olofsson Corp., Lansing, Mich.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Snow Manufacturing Co., Bellwood, Ill.
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Michigan Drill Head Co., Van Dyke, Mich.
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Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 4460 124th St., Milwaukee 10, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.
Edlund Machinery Co. Div., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.
Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.
Moline Tool Co., Moline, Ill.
Morris Machine Tool Co., Inc., 933 Harriet St, Cincinnati 3, Ohio
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Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio
Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Morris Machine Tool Co., Inc., 933 Harriet St., Cincinnati 3, Ohio
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Western Machine Tool Works, Holland, Mich.

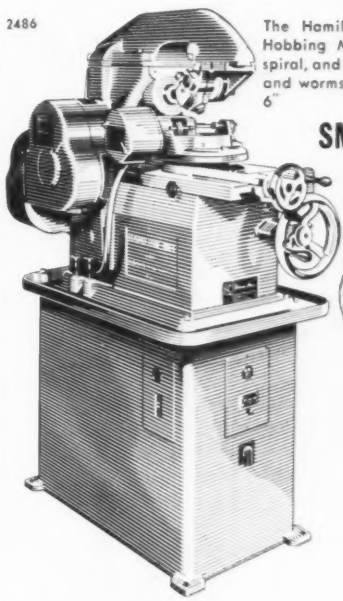
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Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave. Pittsburgh, Pa.
Edlund Machinery Co. Div., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio
Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Leland-Gifford Co., Box 989, Worcester, Mass.
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National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Manufacturing Co., Bellwood, Illinois
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Townsend, H. P., Mfg. Co., Elmwood, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.
Western Machine Tool Works, Holland, Mich.

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2486



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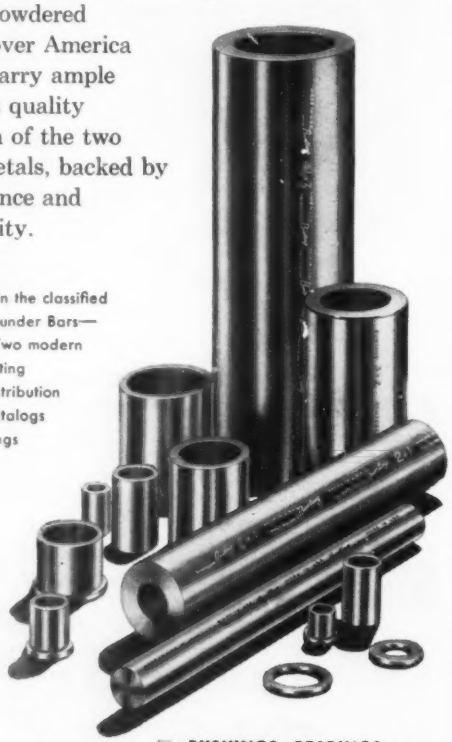


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Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
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Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
DoAll Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoAll Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.
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Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill.
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Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
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Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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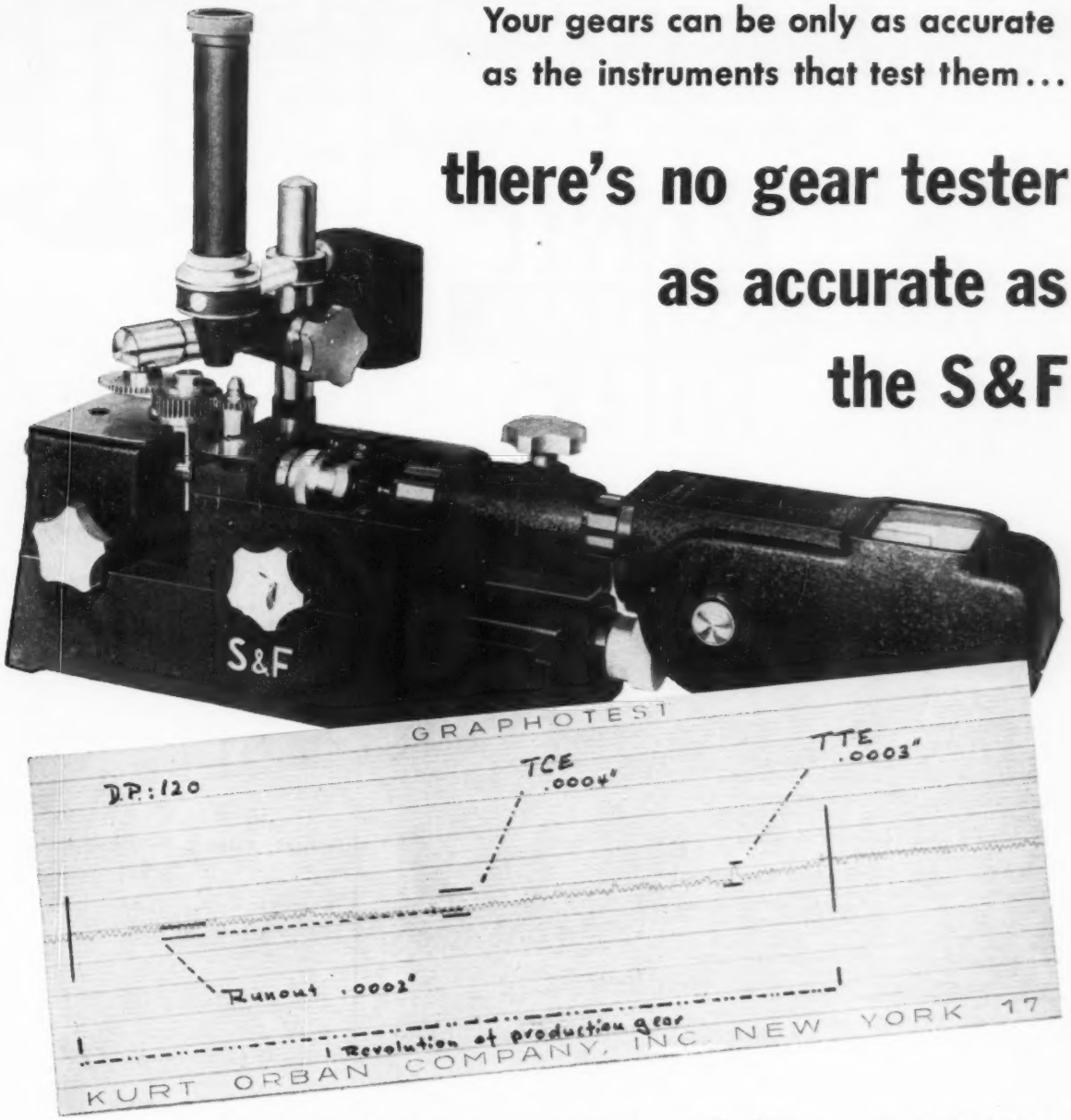
Chicago Pneumatic Tool Co., New York 17, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Thor Power Tool Co., Aurora, Ill.

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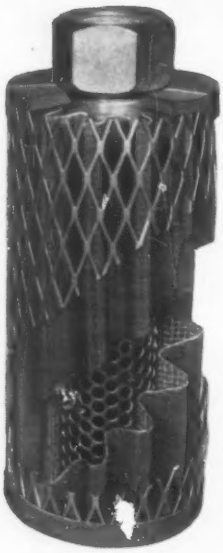
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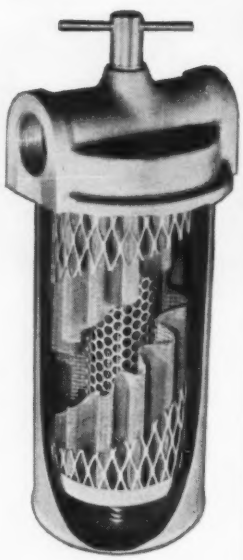
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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoAll Co., Des Plaines, Ill.
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National Twist Drill & Tool Co., Rochester, Mich.
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Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
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Thor Power Tool Co., 175 N. State St., Aurora, Ill.
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist, Carbide, Carbide-tipped

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Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Heller Tool Co., Newcomerstown, Pa.
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Thor Power Tool Co., 175 N. State St., Aurora, Ill.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
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Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
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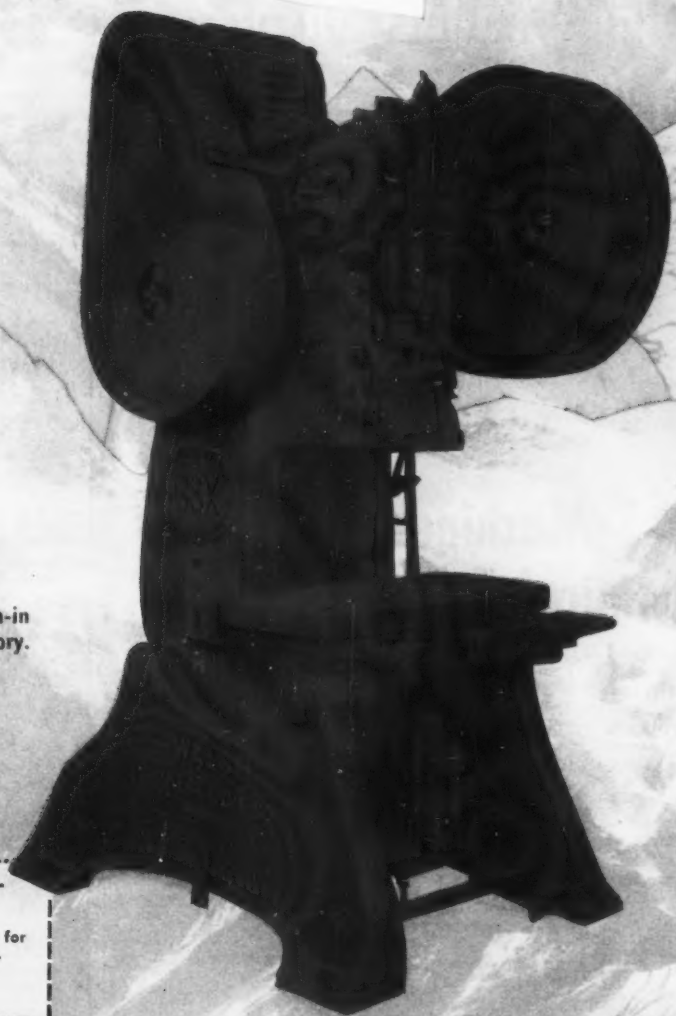
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- ☐ Installation—Instructions for Walsh safety and non-repeating devices—Bulletin ES108
- ☐ "Spec" chart for Walsh Presses—Bulletin ES102
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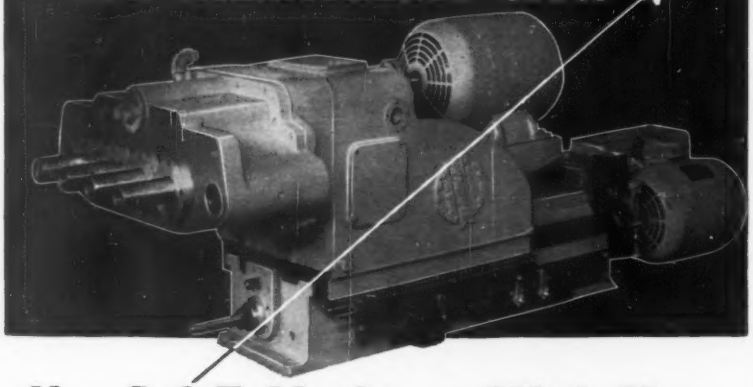
EXTRACTORS, Screw
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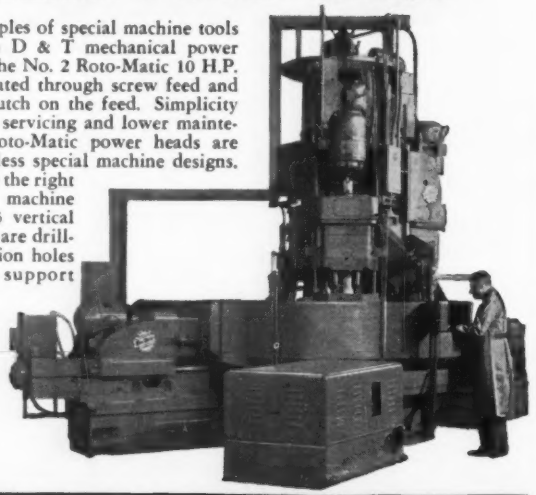
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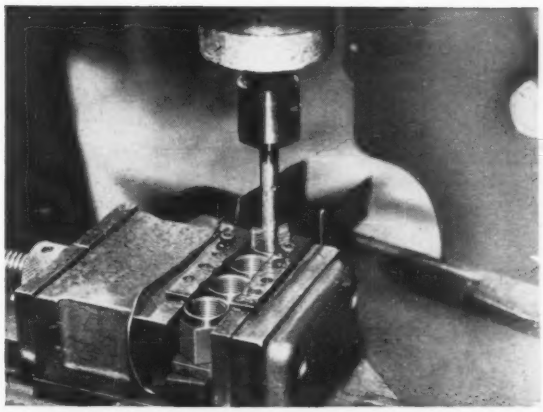
FORGINGS, Drop
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Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Mueller Brass Co., Port Huron, Mich.
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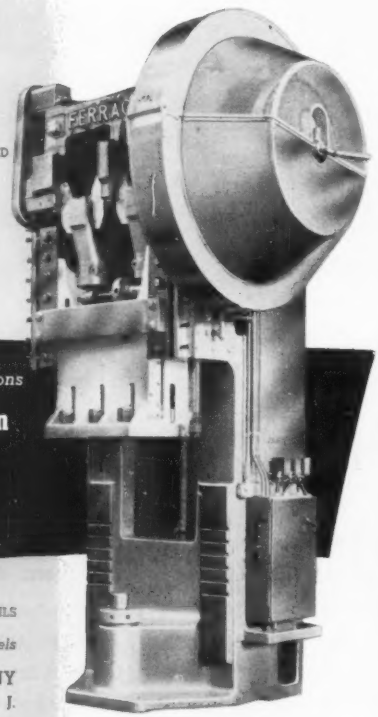
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Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
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Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoALL Co., Des Plaines, Ill.

KOPING

HIGH SPEED LATHE
17⅛" SWING

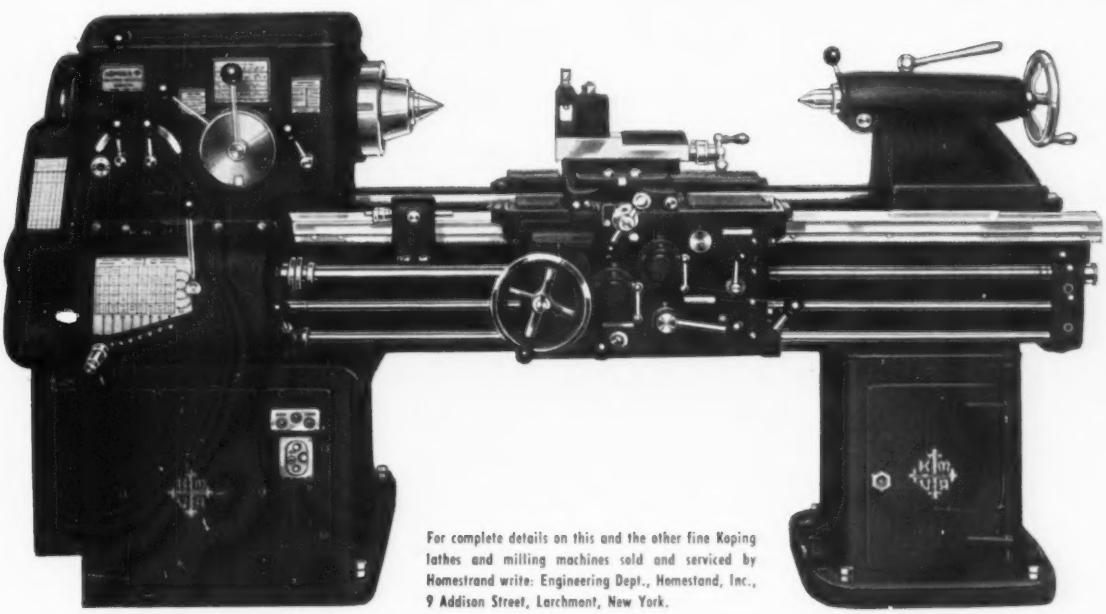
S8B

Designed to meet today's demands for greater stability, more power and higher spindle speeds, the Koping S 8 B is one of fourteen types manufactured in seven sizes. Wide bed casting with high rigid walls braced by strong diagonal ribs. Saddle and tail stock are mounted on separate flame-hardened V and flatways.

The unit features automatic releases on longitudinal and cross feeds. The spindle, which is made with a type L 2 nose has no gears or clutches mounted on it and runs on special precision cylindrical roller bearings with front bearing 4⅛" in diameter.

SPECIFICATIONS

Swing over bed	17⅛"
Spindle speeds, number	18
Spindle speeds in geometric progression	30-1500 r.p.m.
Thread pitches per inch threads, number (and others)	72
Motor	15 HP
Net weight w.o. motor	4850 lbs.



For complete details on this and the other fine Koping lathes and milling machines sold and serviced by Homestrand write: Engineering Dept., Homestand, Inc., 9 Addison Street, Larchmont, New York.

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SWEDEN

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Pratt & Whitney Co., Inc., West Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Van Keuren Co., Watertown, Mass.
Winter Bros. Co., Rochester, Mich.

GAGES, Pressure, Air and Hydraulic

Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.

GAGES, Roll Thread Snap, Adjustable Snap

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Standard Gage Co., Inc., Poughkeepsie, N. Y.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

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Sheffield Corp., Box 893, Dayton 1, Ohio

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio

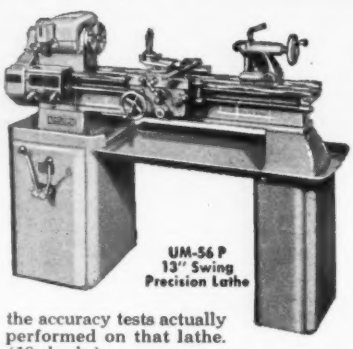
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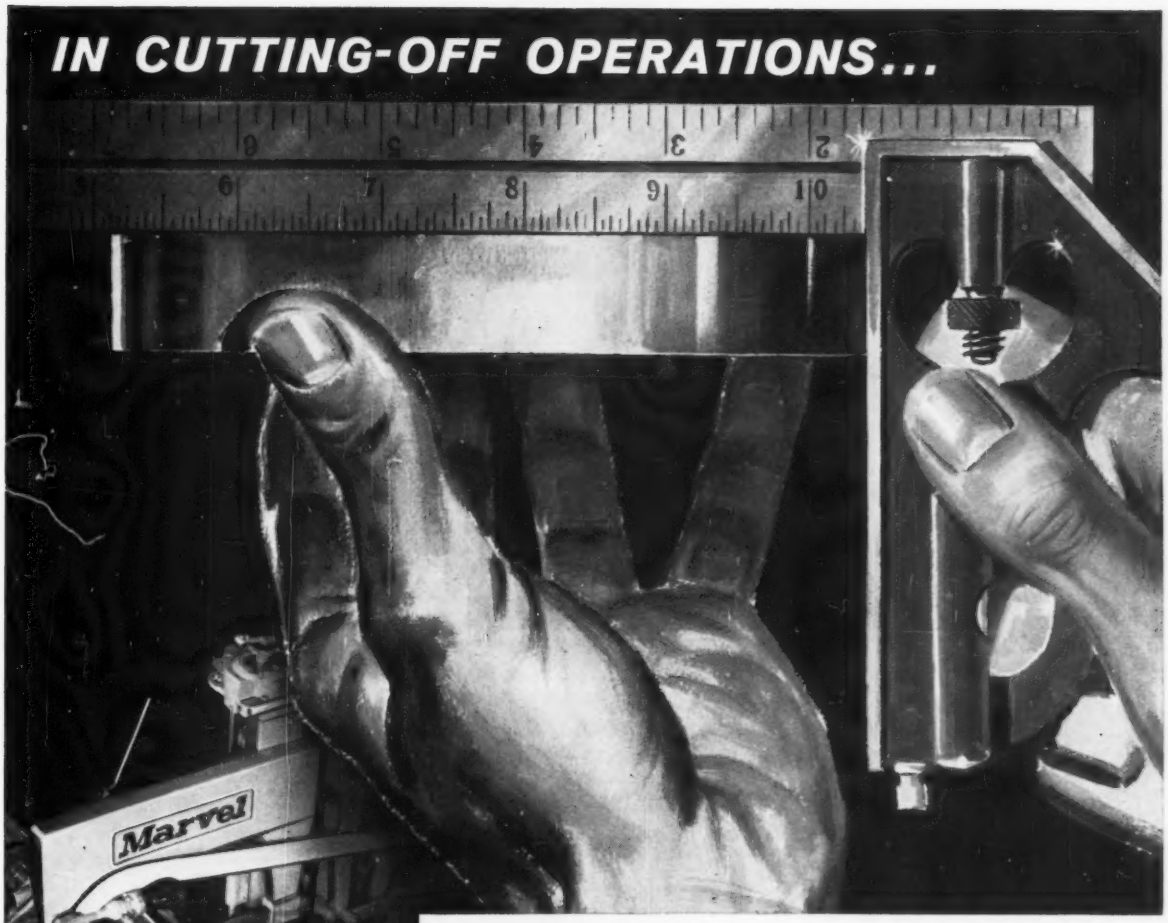
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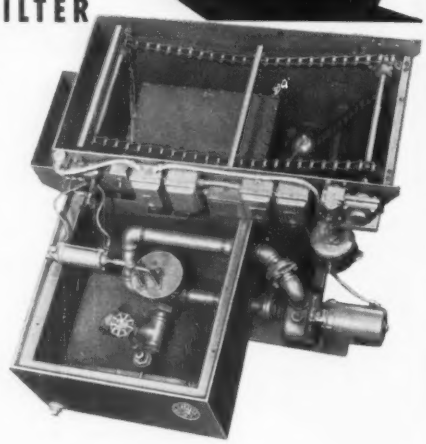
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Diefendorf Gear Corp., Box 934, Syracuse, N. Y.
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New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
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General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

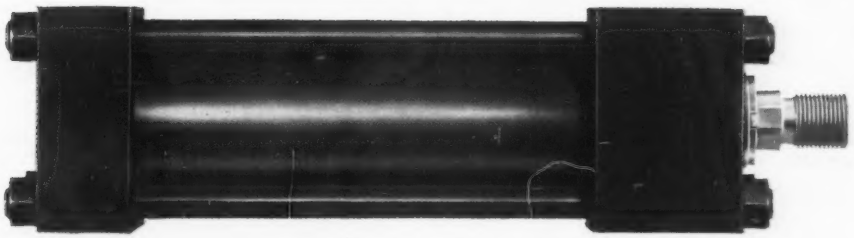
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GRINDERS, Carbide Tool.
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Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
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Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio

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Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

GRINDING GAGES—See Gages, Grinding

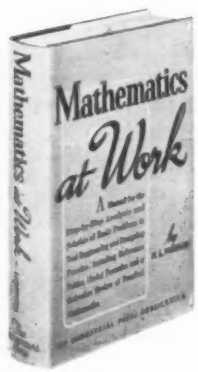
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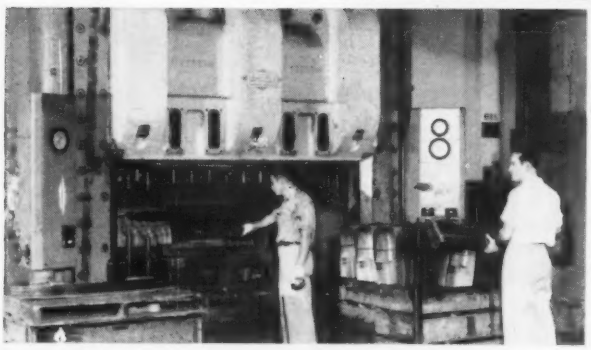
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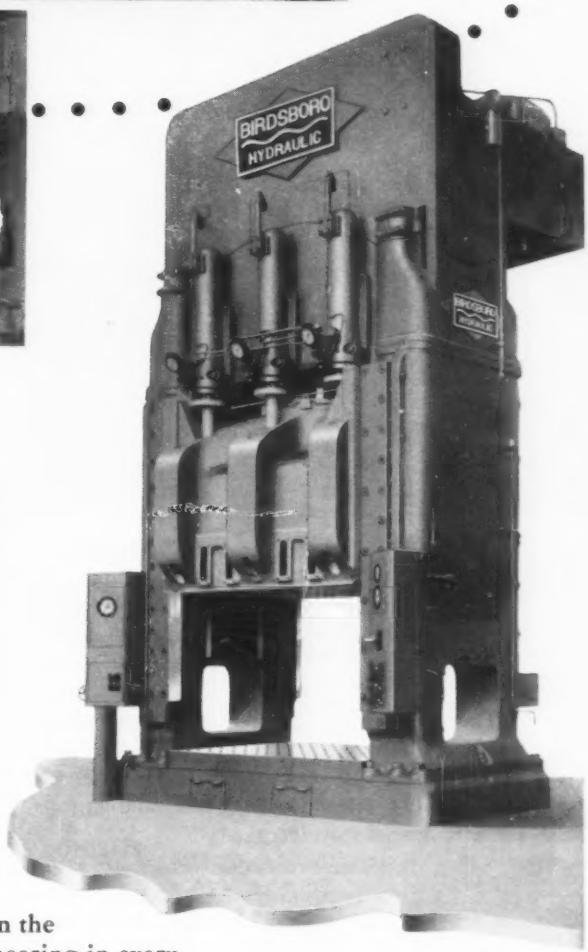
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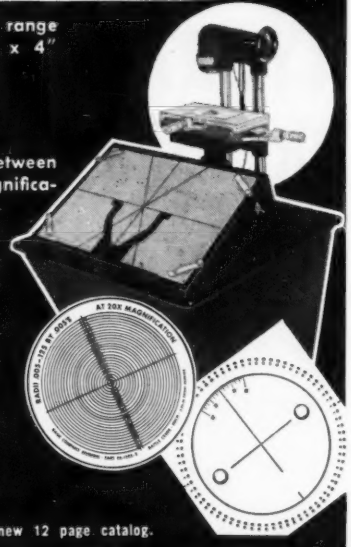
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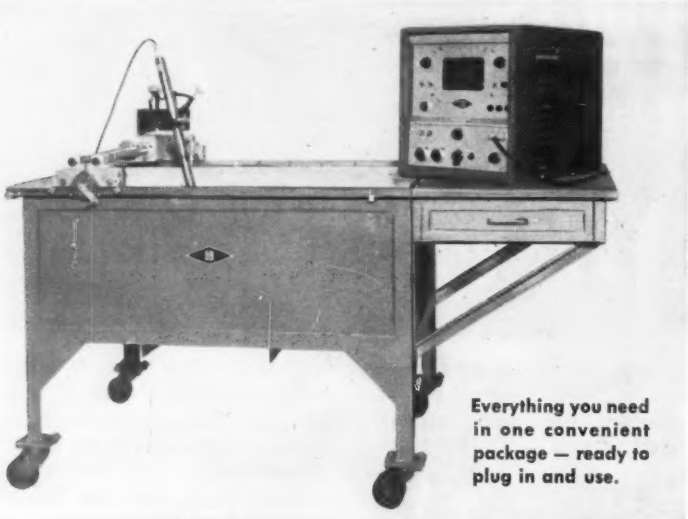
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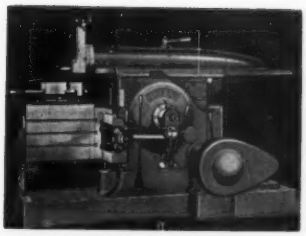
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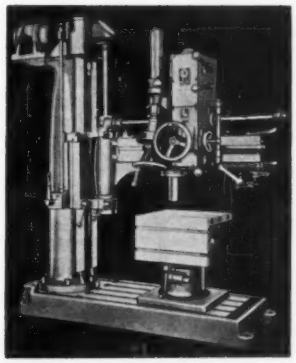
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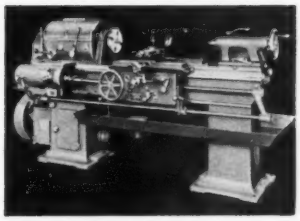
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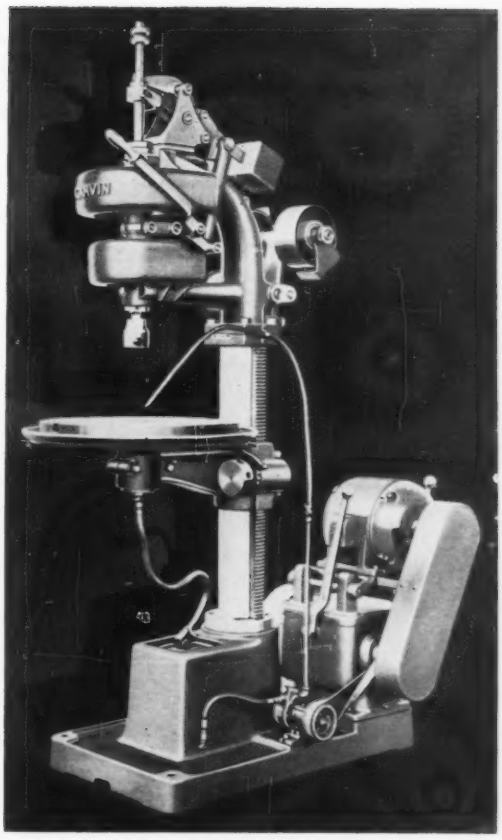


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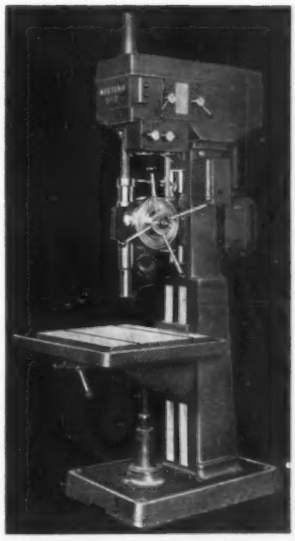


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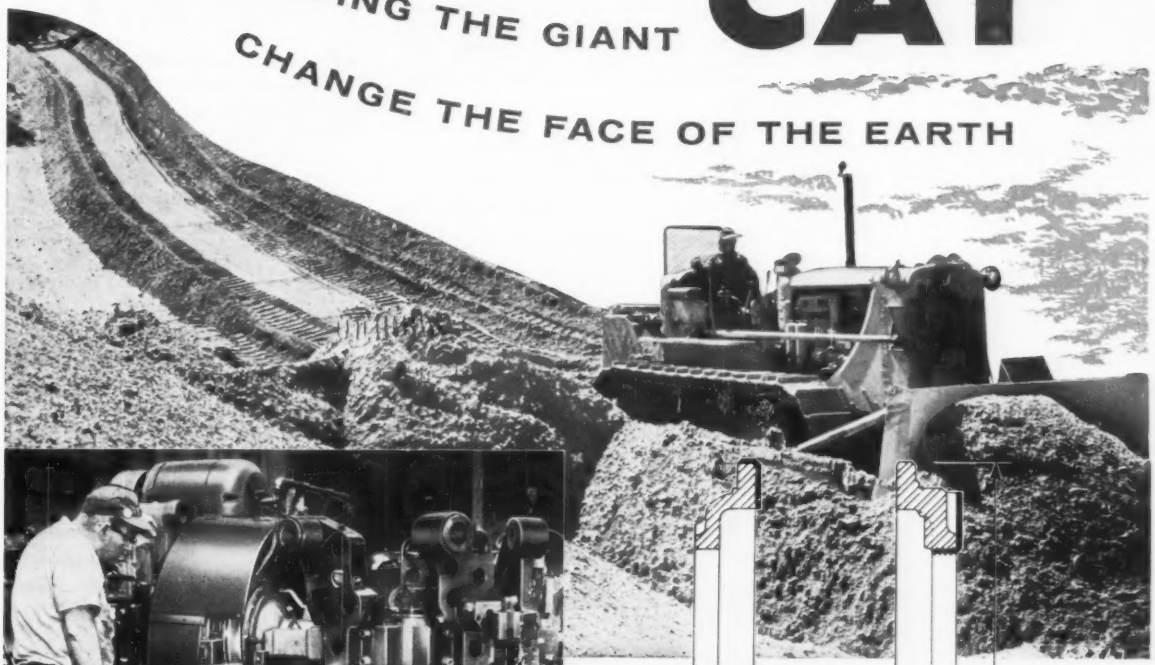
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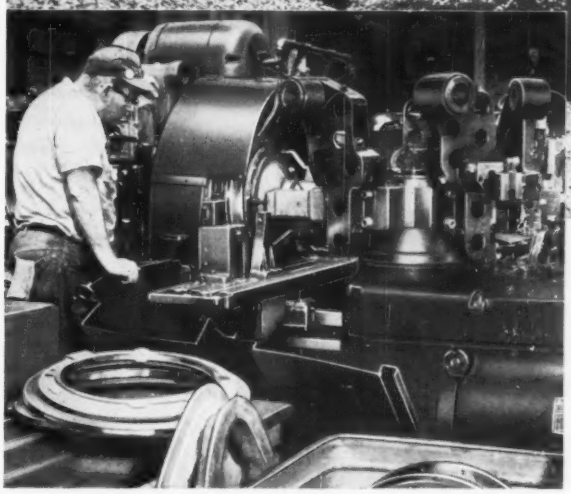
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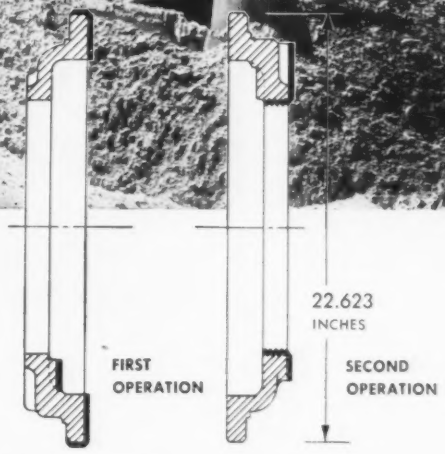
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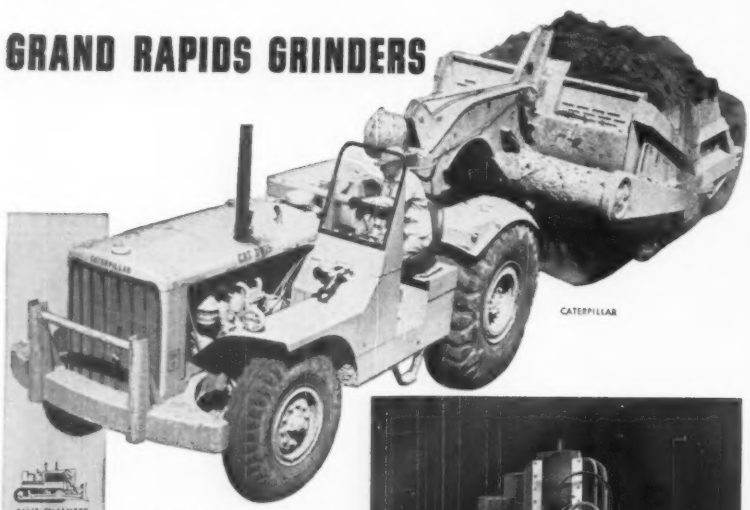
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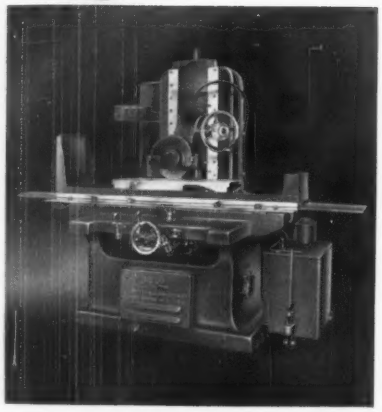
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Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!
If you're not already enjoying these standout features in your toolroom, a note on your letterhead will bring full details.



GRAND RAPIDS No. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speed 1925 and 2500 rpm.

GALLMEYER & LIVINGSTON

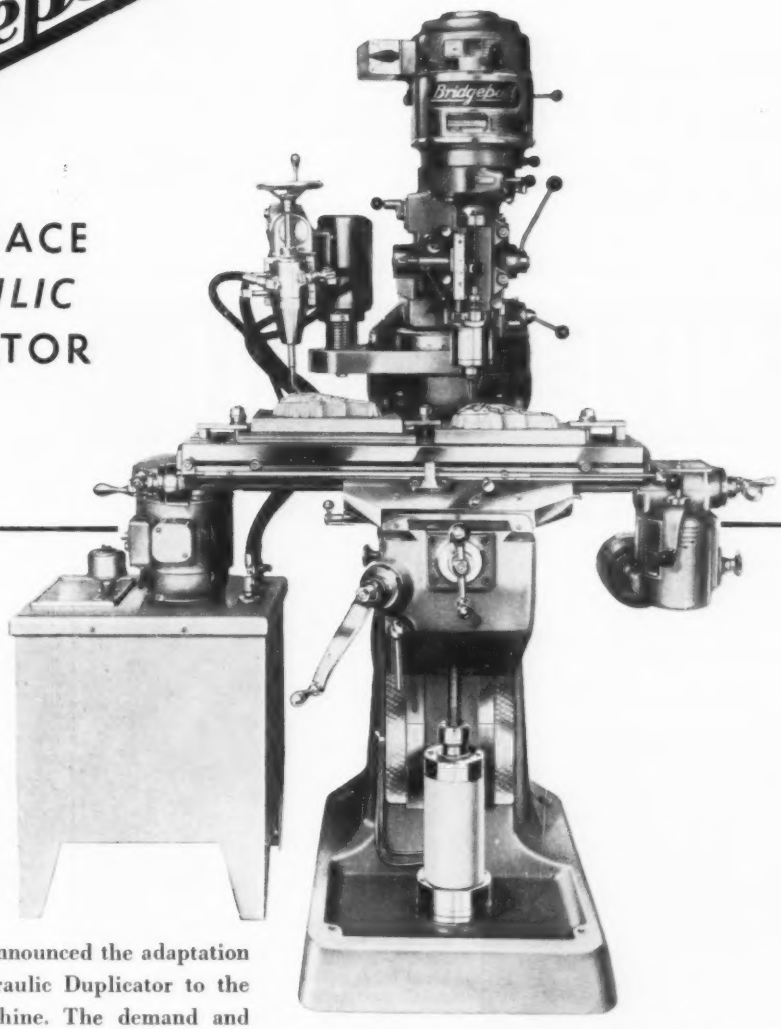
Write for full information.



GALLMEYER & LIVINGSTON CO. 305 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

The Bridgeport

TRUE TRACE *HYDRAULIC* DUPLICATOR



Twelve months ago we announced the adaptation of the True Trace Hydraulic Duplicator to the Bridgeport Milling Machine. The demand and the favorable comments on the performance of this equipment during the past year have exceeded our most optimistic expectations.

The Bridgeport True Trace combination will give excellent performance and save endless hours when copying irregular dies and moulds.

The stylus mounting fits between the column and the turret and is suitable for either right hand or left hand installation on new or old machines.

The stylus assembly swings out of the way so there is no interference when the machine is used for conventional milling.

Full details on request.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

INDICATOR LIGHTS—See Lights, Indicator

INDICATORS, Dial

Ames B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
National Automatic Tool Co., S. 7th-N. Sts., Richmond, Ind.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S. Co., Athol, Mass.

INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Reliance Elec. & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Test

Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp, P. O. Box 1027, Providence, R. I.
National Automatic Tool Co., S. 7th - N Sts., Richmond, Ind.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio

INSPECTING EQUIPMENT, Ultrasonic

Curtiss-Wright Corp., Caldwell, N. J.

INTENSIFIERS, Hydraulic

Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.
Oilgear Co., 1560 W. Pierce St. Milwaukee 4, Wis.
Watson-Stillman Co., Roselle, N. J.

JACKS, Planer—See Set-up Equipment

JIG BORERS

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Homestrand, Inc., Larchmont, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

JIGS AND FIXTURES

Acromark Co. 9-11 Morrell St., Elizabeth, N. J.
Bath, Cyril Co., Aurora & Solon Road, Solon, Ohio
Columbus Die Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Metal Carbides Corp., Youngstown 12, Ohio
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 28, Mich.
Portage Mch. Co., 1025 Sweitzer Ave., Akron 11, Ohio
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio
Bliss, E. W. Co., Canton, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Heller Tool Co., Heller Dr., Newcomerstown, Ohio
Mitts & Merrill, 1809 S. Water St., Saginaw, Mich.

LAPPING MACHINES

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)
DoAll Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Size Control Co., Div. of American Gage & Mch. Co., 2500 W. Washington Blvd., Chicago 12, Ill.

LATHE ATTACHMENTS

Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jones & Lamson Mch., 512 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Williams, J. H. & Co., 400 Vulcan St. Buffalo 7, N. Y.

LATHES, AUTOMATIC—See Chucking Machines

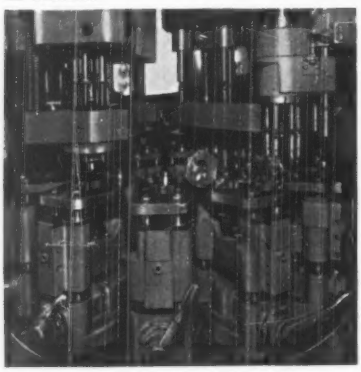
MILLHOLLAND

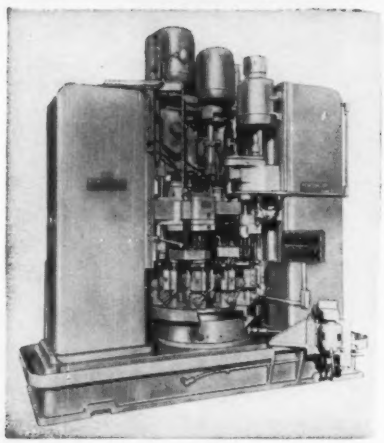
12-Station Vertical Indexing Machine

34 Spindles!

93 Pieces per Hour!

Here is Millholland versatility in action!





Lead Screw Tapper with reversing motor drives a 6-spindle tapping head. All machine elements are electrically synchronized, with push-button control for "cycle start," automatic single cycle, set-up and emergency stop. Chip disposal is simplified with wiper blades rotating within a ring on the index table to bring chips to a removable pan.

Unique Holding Fixture

With a 31-second cycle time, this machine produces 93 pieces per hour at 80% efficiency! This chip cutting efficiency is made possible by the distinctive design of the plate type cam used in Millholland Automatic Units, plus the action of the pneumatic counterbalance.

Two No. 5 Units are mounted vertically, the first with 22 spindles, the second with 5; a No. 2 unit is mounted horizontally on a rapid travel slide, and an Automatic

Part requirements dictated location using self-centering horizontal vees with up-acting clamps, actuated by a single handle operating through a small arc. Fixtures also contain register pins for all bushing plates. The 12 fixtures are mounted on an independently powered automatic index table with self-contained lubrication pump.

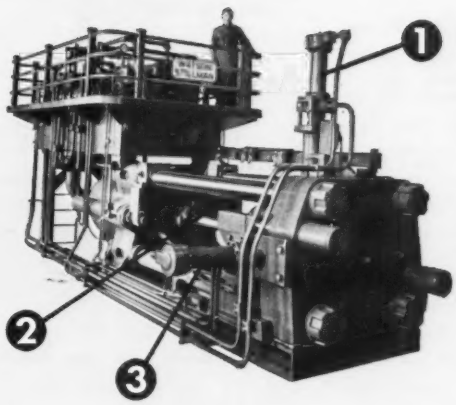
A complex production problem, solved efficiently with Millholland equipment and Millholland know-how.

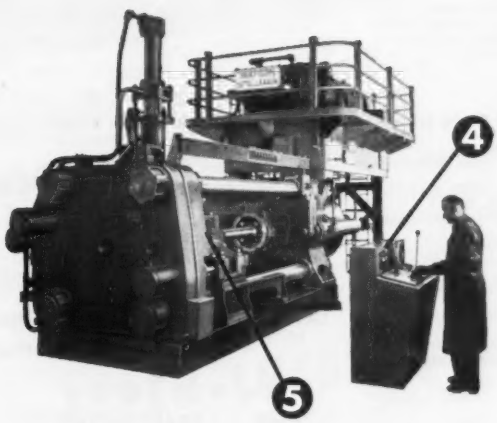
Write for Bulletin M-2 giving further details.

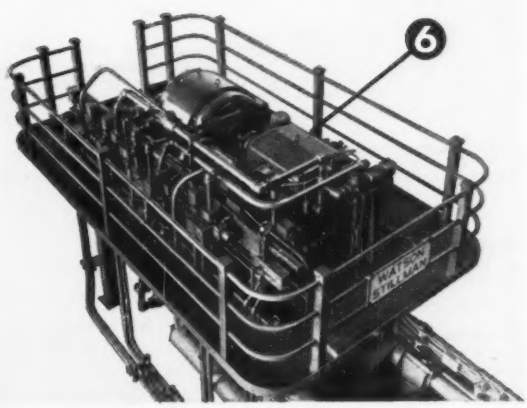
W. K. MILLHOLLAND MACHINERY CO.
6402 Westfield Blvd. Indianapolis 20, Indiana

From any angle...

you can spot the advantages of W-S aluminum extrusion presses







1 HYDRAULIC SHEAR
Full-length shear-blade holder, working within a rugged shear housing eliminates blade deflection. The shear is operated from the control station, and is positively interlocked to prevent out-of-sequence operation.

2 EXTRUSION PLUNGER
Three accessible jack screws give fast, accurate adjustment of plunger alignment with container bore. Plunger tip designed to engage dummy block as plunger moves forward, permitting rapid retraction of loader. Loader starts retracting before billet is completely within container.

3 DIE SLIDE DESIGN
Design assures positive positioning of die during entire cycle. Shape or tubular type dies are quickly and easily changed with minimum interruption in normal production time. Straight-line, in-or-out motion permits perfect visual alignment of dies.

4 CONTROLS
Push button controls, mounted in a pulpit type station give the operator "finger-tip" control of all press operations. Selector switch permits changing automatic-cycle operation from conventional to latest bridge-type-die extrusion.

5 RADIANT-TYPE CONTAINER HEATING
Heating elements of uniform size and type are mounted directly in container housing. New type mounting permits required expansion and contraction without damaging electrical connections. Quick-disconnect plugs for electrical system speed removal of container from housing.

6 HYDRAULIC SYSTEM
Main pumps are radial piston type, directly coupled to electric motors. A separate holding pump is furnished to assure positive sealing of container against die during extrusion, minimizing "flashing."

Next time you're in the market for extrusion presses, compare these W-S advantages. Presses available from 600 tons to the largest size required by industry.

WATSON-STILLMAN

WATSON-STILLMAN PRESS DIVISION
FARREL-BIRMINGHAM COMPANY, INC.
160 Aldene Road, Roselle, New Jersey
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
European Office: Piazza della Republica 32, Milano, Italy

W-S HYDRAULIC

WS-23

LATHES, Axle

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Consolidated Mch. Tool Div., Farrel-Birmingham Co., Inc., Rochester 10, N. Y.
Monarch Mch. Tool Co. Oak St., Sidney, Ohio
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Atlas Press Co., Kalamazoo, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Homestrand, Inc., Larchmont, N. Y.
LeBlond R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Levin, Louis & Son, Los Angeles 21, Calif.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Car Wheel

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Bullard Co., Bridgeport 6, Conn.
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Wickes Brothers, 512 No. Water St., Saginaw, Mich.

LATHES, Double-End

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Wickes Brothers, 512 No. Water St., Saginaw, Mich.

LATHES, Duplicating

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Baldwin-Lima-Hamilton Corp. Lima Hamilton Div., Hamilton, Ohio
Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Sidney Machine Tool Co., Sidney, Ohio
Trinlex Machine Tool Corp., 75 West St., New York 6, N. Y.

LATHES, Engine, Manufacturing

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Barber-Colman Co. (Hendey Mch. Div.), Rockford, Ill.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Eustacchio, S., Brescia, Italy.
Homestrand, Inc., Larchmont, N. Y.
Hydra-Feed Mch. Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio
Western Machine Tool Works, Holland, Mich.
Wickes Brothers, 512 No. Water St., Saginaw, Mich.

LATHES, Engine, Toolroom

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Barber-Colman Co. (Hendey Mch. Div.), Rockford, Ill.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros. Inc., 1420 College Ave., Elmira, N. Y.
Homestrand, Inc., Larchmont, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio
Western Machine Tool Works, Holland, Mich.
Wickes Brothers, 512 No. Water St., Saginaw, Mich.

LATHES, Gap

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Homestrand, Inc., Larchmont, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
Sidney Machine Tool Co., Sidney, Ohio
Springfield Mch. Tool Co., Springfield, Ohio

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co. 3055 Colerain Ave., Cincinnati 25, Ohio
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Roll

American Tool Works Co., Cincinnati 2, Ohio
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Bliss, E. W., Co., Canton, Ohio
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Monarch Mch. Tool Co. Oak, St., Sidney, Ohio

LATHES, Speed, Second-operation

Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., Cincinnati 25, Ohio
Monarch Mch. Tool Co. Oak, St., Sidney, Ohio
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., 4258 N. Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio

LATHES, Spinning

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 19, Ohio
Lodge & Shipley Co., The, Cincinnati 25, Ohio

LATHES, Toolroom—See Lathes, Engine, Toolroom

LATHES, Turret, Automatic

Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgewater 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
Nat'l Acme Co., 170 E. 131st St., Cleveland 3, Ohio
New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.

LATHES, Turret, Ram Type, Saddle Type

Atlas Press Co., Kalamazoo, Mich.
Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., 1420 College Ave., Elmira, N. Y.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
Levin & Son, Inc., Louis, Los Angeles 8, Calif.
New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mach. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Wks. South Bend 22, Ind.
Warner & Swasey Co., 5701 Carnegie Ave Cleveland 3, Ohio

LATHES, Turret Vertical—See Boring Mills, Vertical

LAYOUT and DRAFTING TOOLS

Browne & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett, L. S., Co., Athol, Mass.

LEVELS

Lufkin Rule Co., Saginaw, Mich.
South Bend Lathe Wks. South Bend 22, Ind
Starrett, The L. S., Co., Athol, Mass.

LIGHTING FIXTURES, Machine

Sun-Lite Mfg. Co., 2555 Bellevue Ave., Detroit 7, Mich.

LIGHTS, Indicator

Dialight Corporation, 60 Stewart Ave., Brooklyn 37, N. Y.
General Electric Co., Schenectady, N. Y.

LIMIT SWITCHES—See Switches, Limit



Saves Time... Cuts Costs

Rotary Planer • • • do milling jobs in one-third to one-seventh of time on an Espen-Lucas Rotary Planer.

Big Sawing • • • production cutting of large stock —rapid, easy, straight-to-a-line piece after piece—on Espen-Lucas Cold Sawing Machines.

The **ESPEN-LUCAS** *Machine Works*

Front Street and Girard Ave., Phila. 23, Pa.

BUILDERS OF LARGE COLD SAWING MACHINES • ROTARY PLANERS • COLUMN FACERS • HEAVY TYPES OF SPECIAL MACHINERY



CENTRIFUGALLY CAST FOR PRESSURE SERVICE. This large sluice gate operating cylinder, assembled by precise shrink fit as shown here, will safely handle pressures up to 250 psi. The Meehanite Metal cylinder housing, sleeved with a bronze liner 20″ in diameter . . . are both centrifugally cast by Shenango for increased tensile strength and improved resistance to wear, stress and abrasion. For complete information on rough finished, semi-machined or precision-machined parts, ferrous or non-ferrous, write to: Centrifugally Cast Products Division, The Shenango Furnace Company, Dover, Ohio.

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MONEL METAL • NI-RESIST • MEEHANITE METAL • ALLOY IRONS

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Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave. Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Shell Oil Co. 50 W. 50th St., New York, N. Y.
Standard Oil Co. (Indiana) 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

LUBRICATING SYSTEMS
Farval Corp., 3249 E. 80th St., Cleveland, Ohio
Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago 23, Ill.
Madison-Kipp Corp., Madison, Wis.

MACHINERY, Used and Rebuilt
Eastern Mchry. Co., 1000 Tennessee Ave., Cincinnati, Ohio
Michigan Drill Head Co., Van Dyke, Mich.
Miles Mchry Co., 2025 E. Genessee Ave., Saginaw, Mich.
Motch & Merryweather Mchry. Co., 888 E. 70th St., Cleveland 3, Ohio
Van Keuren Co., Watertown 72, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Niagara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.
Starrett, L. S., Co., Athol Mass.

MANDRELS—See Arbors and Mandrels

MARKING MACHINES and DEVICES
Acromark Co., 9-11 Morrell St., Elizabeth 4, N. J.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.

MATERIAL-HANDLING TRUCKS—See Trucks, Material Handling

MEASURING MACHINES
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Van Keuren Co., Watertown 72, Mass.

MEASURING WIRES, Thread, Spline, Gear
Sheffield Corp., Dayton 1, Ohio
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Van Keuren Co., Watertown 72, Mass.

MICROMETER HEADS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
DoAll Co., Des Plaines, Ill.
Starrett, The L. S., Co., Athol, Mass.

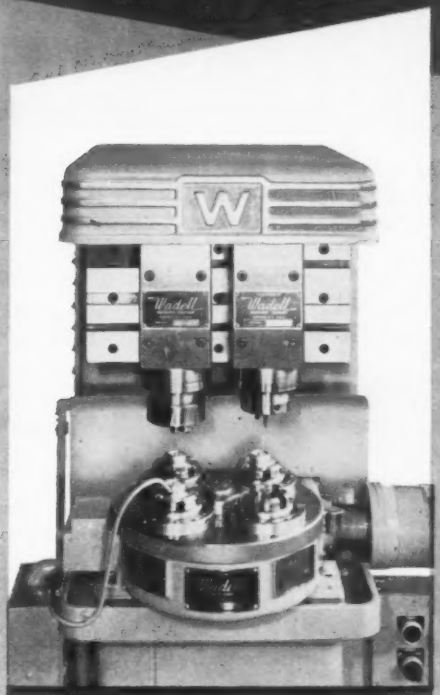
MICROMETERS, Outside, Inside, Depth
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., Watertown 72, Mass.

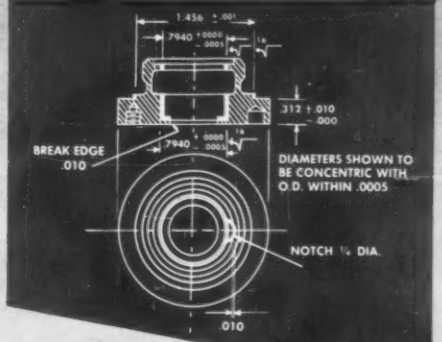
MICROSCOPES, Toolmakers'
DoAll Co., Des Plaines, Ill.
Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

NO TIME LOST LOADING AND UNLOADING

using an automatic index set-up on the WADELL VBM automatic

Operator can load and unload workpieces into the chucks or fixtures while the machine is cycling automatically. This set-up on short cycle time operations can easily increase production output as much as 50%.
Wadell engineering and standard tooling components can provide you with a **"PRODUCTION PACKAGE"** that will meet your most exacting requirements for accuracy and speed. Completely automatic machines including loading and unloading with automatic gaging can be furnished.



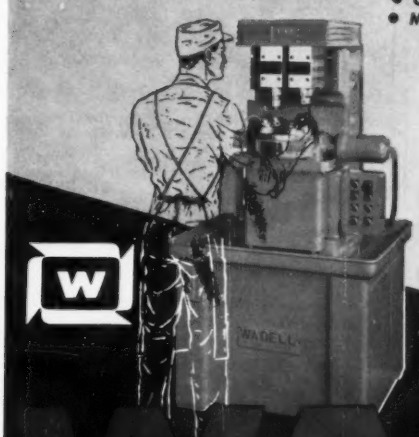


Actual installation at large *West Coast manufacturing plant.

- **OPERATION:** Bore, turn and mill.
- **MATERIAL:** Aluminum Alloy 115T.
- **TOLERANCES:** As shown.
- **PRODUCTION:** 360 pcs/hr at 100% efficiency.

* Name on request.

Machined as indicated by heavy lines.



WADELL

EQUIPMENT COMPANY
CLARK, NEW JERSEY

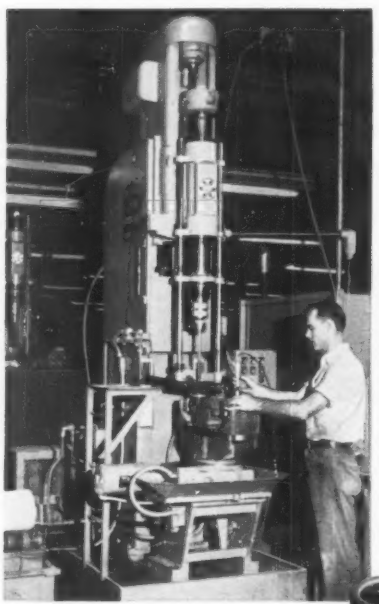
for further information contact the dealer nearest you

Atlanta, Ga., Allison Machinery Co.; Buffalo - Rochester, N. Y., G. W. Brunton & Son, Inc.; Chicago, Ill. - Milwaukee, Wis. - Minneapolis, Minn., Bryant Machinery & Engineering Co.; Boston, Mass., General Machinery Corp.; New Haven, Conn. - New York, N. Y., Giebel, Inc.; Philadelphia, Pa., Lemuel R. Lance Co.; Grand Rapids, Mich., Joseph Monahan Co.; Indianapolis, Ind. - Toledo, O., Oatis Machinery Co.; Portland, Ore., Portland Machinery Co.; Los Angeles, Cal., Seaboard Machinery; Dayton - Columbus - Cincinnati, O., The Seifreat-Elstad Machinery Co.; San Francisco, Cal., M. A. Sherritt Co.; Syracuse, N. Y., H. A. Smith Co.; Cleveland, O. - Pittsburgh, Pa., Wm. K. Stamets Co.; Detroit, Mich., Chas. A. Strelinger Co.; Washington, D. C., George E. Viereck & Co., Inc.; Scottsdale, Ariz., Wilson Machinery Corp.; Montreal - Toronto - Quebec - Windsor - Ottowa, Canada, Williams & Wilson Ltd.

For more information fill in page number on Inquiry Card, on page 239

WHY Emerson Electric MICROHONES Laminated Steel Rotors

The Emerson Electric Manufacturing Company is constantly searching for the best possible processing methods. Working with Micromatic engineers on problems encountered in processing shaft holes in their laminated steel rotors, Emerson Electric found that Microhoning would provide much higher production quality while lowering processing costs. The following Microhoning benefits are now obtained:



Model 728 Hydrohoner with automatic Microsize, Microdial and two station rotary indexing fixture. Hole Tolerances: Diameter .0002 inch, straightness and roundness .0001 inch.

CUT REJECTS
With former processing method rejects ran too high. Microhoning controls size and assures a clean hole—rejects are substantially reduced.

ELIMINATED OPERATIONS
Old processing method required two operations. In one operation, Microhoning generates size and straightness within specified tolerances.

REDUCED BALANCING TIME 70%
To preclude vibration and poor operating characteristics, it is essential that shaft hole be concentric with O.D. of rotor. Microhoning reduced by 70% the amount of dynamic balancing correction required.

PROCESSING COSTS CUT 70%
Current figures show the cost of Microhoning shaft holes in rotors to be less than 30% of processing by old method.



Rotors (from 2¼ to 4 inches long) are all Microhoned on the same machine by changing adaptor in fixture and resetting stroke length.

Learn why Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____ D

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

MILLING MACHINE ATTACHMENTS

Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling & Grinding Mches, Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Div. 2011 Eastern Ave., Cincinnati 2, Ohio
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp. Milwaukee, Wis.
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Marac Machinery Corp., Yonkers, N. Y.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Motch & Merryweather Machinery Co., Perron Bldg., Cleveland, Ohio
Pratt & Whitney Co., Inc., West Hartford, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench, Hand

Atlas Press Co., Kalamazoo, Mich.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Morris, Robert E. Co., 76 Mamaroneck Ave., White Plains, N. Y.

MILLING MACHINES, Bed Type, Simplex, Duplex

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Cincinnati Milling & Grinding Mches., Inc., 470 Marburg Ave., Cincinnati 9, Ohio
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Morris, Robert E. Co., 76 Mamaroneck Ave., White Plains, N. Y.
Motch & Merryweather Mchry. Co., 888 E. 70th St., Cleveland 3, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Die Sinking, Duplicating, Profiling

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

Elox Corp. of Mich., 1830 Stephenson Highway, Royal Oak 3, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

MILLING MACHINES, Knee Type, Horizontal, Plain, Universal

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Div., 2009 Eastern Ave., Cincinnati, Ohio
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Knee Type Rise and Fall

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.

MILLING MACHINES, Knee Type Ram

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Knee Type, Turret

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.

MILLING MACHINES, Knee Type, Vertical

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.
Atlas Press Co., Kalamazoo, Mich.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 450 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Homestrand, Inc., Larchmont, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
South Bend Lathe Wks., South Bend 22, Ind.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio

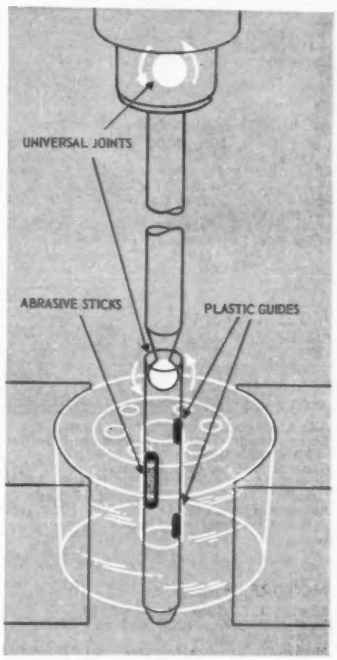
HOW MICROHONING Laminated Rotors Cuts Processing Costs

Emerson Electric squirrel-cage rotors are made of special "electrical grade" steel laminations and each lamination is coated with oxide insulation. In processing the rotor, the O.D. is turned concentric with the shaft hole. Then, in one operation, Microhoning accurately generates finished size and straightness of shaft hole without any change in hole location.

The Micromold tool has two universal joints in the drive shaft which allow the tool body to align itself with the shaft hole. Microhoning of holes is along same axis from which O.D. was turned.

For electrical and mechanical efficiency, assembled motors must have a uniform air-gap between rotor and stator of .006 inch to .011 inch. Because laminated surface is rough and close tolerances must be held, special guided Micromold tools are used. Plastic guides above and below abrasive sticks, control dressing of abrasive and assure generation of round, straight shaft holes.

Before installing Microhoning equipment, two operations were required to finish shaft hole—rejects ran high. Microhoning greatly reduced the amount of dynamic balancing correction required.



The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____ D

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

For more information fill in page number on Inquiry Card, on page 239

Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

MILLING MACHINES, Spar

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

MILLING MACHINES, Thread

Coulter Mch. Co., James, Bridgeport 5, Conn.
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.
Lees-Bradner Co., The, Cleveland 11, Ohio

MOLDING MACHINES, Plastic

Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio
Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engrg. Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Watson-Stillman Co., Roselle, N. J.

MOLYBDENUM

Climax Molybdenum Co., New York, N. Y.

MOTORS, Electric

Allis-Chalmers Mfg. Co. Milwaukee, Wis.
Delta Power Tool Div., Rockwell Mfg. Co. Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Lincoln Electric Co., Cleveland 17, Ohio
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio

MOTORS, Hydraulic

Barnes, J. S. Corp., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.
Vickers, Inc., Detroit 32, Mich.

MULTIPLE INSPECTION GAGES—See Gages, Multiple Inspection

MULTIPLE-STATION MACHINES, Dial Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.
Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.
Federal Prod. Corp., 1144 Eddy St., Providence 1, R. I.
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
La Salle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.
Michigan Drill Head Co., Van Dyke, Mich.
Millholland, W. K., Mchry. Co., Inc., Indianapolis 20, Ind.
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.
National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

MULTIPLE-STATION MACHINES, Transfer Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.
Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.
Buhr Mch. Tool Co., 839 Green St., Ann Arbor, Mich.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Milling Mch. Co., Cincinnati 9, Ohio
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Greenfield Bros. & Co., 2136 - 12th St., Rockford, Ill.
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Kearney & Trecker Corp., Milwaukee, Wis.
La Salle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.
Michigan Drill Head Co., Van Dyke, Mich.
Millholland, W. K., Mchry. Co., Inc., Indianapolis 20, Ind.
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.
Moline Tool Co., 102-20th St., Moline, Ill.
National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.
Verson Allsteel Press Co., 9399 S. Kenwood Ave., Chicago 19, Ill.

NIBBLING MACHINES

Thor Power Tool Co., 175 N. State St., Aurora, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.

NICKEL AND NICKEL ALLOYS

Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.

NUT SETTERS—See Screwdrivers, etc.

NUTS—See Bolt, Nuts and Screws

OIL EXTRACTORS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.
Wicaco Mch. Corp., Philadelphia, Pa.

OILS, CUTTING SOLUBLE—See Cutting and Grinding Fluids

OILS, Lubricating—See Lubricating Oils and Greases

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 - 5th Ave., New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
DoAll Co., Des Plaines, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12 N. Y.
Van Keuren Co., Watertown 72, Mass.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Roselle, N. J.

PAINTING EQUIPMENT, Spray—See Spraying Equipment, Metal

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., Des Plaines, Ill.
Lufkin Rule Co., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PIPE, Steel, Stainless, etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Babcock & Wilcox Co. (Tubular Prod. Div.), Beaver Falls, Penna.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 105 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square,, Pittsburgh 22, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE AND TUBING MILLS, Electric-weld

Yoder Co., 5504 Walworth Ave., Cleveland 2,

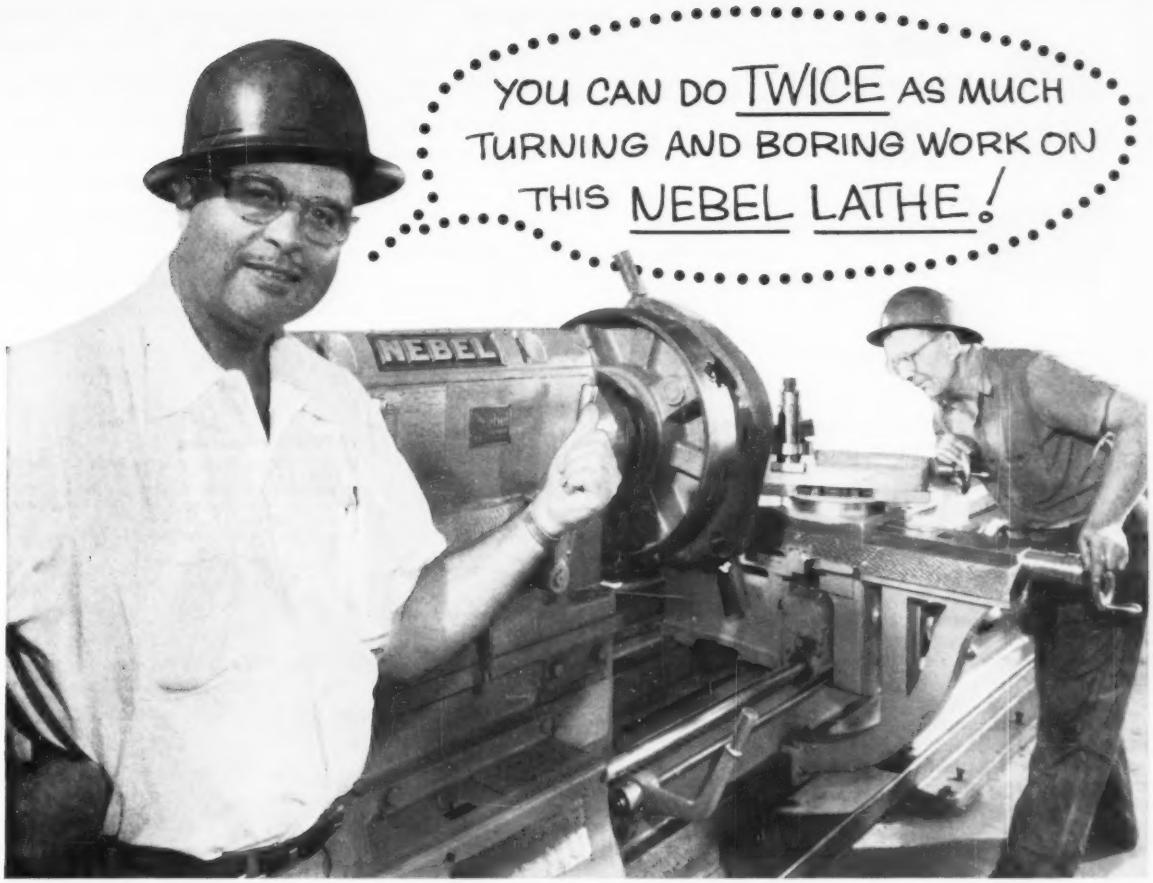
PIPE AND TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.

PIPE THREADING AND CUTTING MACHINES

Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Landis Machine Co., Inc., Waynesboro, Pa.
Sheffield Corp., Dayton 1, Ohio

PLANER JACKS—See Set-up Equipment



"Real money-maker"—that's what our customers say about Nebel extension bed gap lathes.

"Saved $15,000 a year on creative mill work."

"Returned a third of its purchase price in less than two years."

"Has stepped up production from 2,000 to 2,500 units of rough and precision pieces a year."

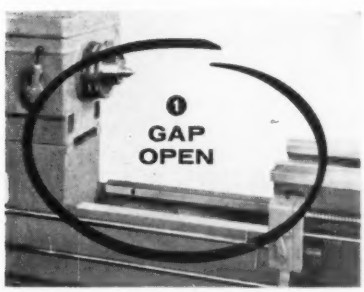
"Eliminated costly shutdowns which ran as high as $1,000 per week."

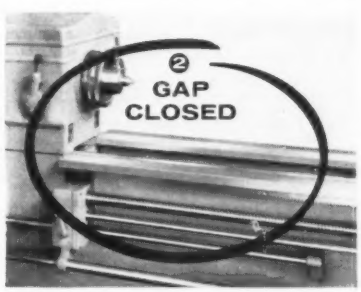
Another customer chucks a complete 4500-lb. pump rotor on a large face plate, and swings it in the wide, deep Nebel gap, without taking it apart.

Here's why the Nebel extension bed gap lathe is the "money-making-est" lathe in the business: Built to complete A.S.A. Lathe Standards, it offers (1) the productive capacity of two ordinary lathes, (2) the precision performance of more expensive lathes and (3) the facilities of a vertical boring mill.

Made in three models and sizes — AG 20″ 40″ medium duty, G 28″/50″ heavy duty and XB 20″/40″ heavy duty—there's one that will fit your specific requirements exactly. Nebel also manufactures removable block gap lathes in three swing sizes and standard lathes in six swing sizes 16″ to 36″. For complete information, write for descriptive bulletins. Nebel Lathe Division, Nebel Machine Tool Corp., 3410-A Central Parkway, Cincinnati 25, Ohio.

GET THE CAPACITY OF TWO LATHES . . . WITH BUT ONE INVESTMENT





Nebel
LATHES
CINCINNATI

For more information fill in page number on Inquiry Card, on page 239



DO IT YOURSELF and SAVE SAVE SAVE

VICE-PRESIDENT, THE CINCINNATI GEAR CO.

News Item: *Statistics show that hospital emergency wards do a rushing business on weekends — and not just after Saturday midnite, either, but* all *weekend long — patching split heads, wrenched backs, mashed thumbs, broken arms and chopped feet. All this "business" results from that modern phenomena, "do it yourself."*

Any fool knows that "do it yourself" is the way to "Save - Save - Save," as the TV commercials say. But some of the *smarter* people have discovered that "do it yourself" isn't necessarily the bargain-counter proposition it's been made out to be — that the fun you get out of it (if any) generally costs *money* in the long run. These people are relearning a truth established years ago that the Division of Labor, or specialization, results in greater efficiency. This holds just as true in the production of industrial goods such as gears: the actual cost, hidden as well as apparent, of gears produced in a back shop or part-time department is bound to be greater than the ultimate cost of gears produced by an efficient, highly-specialized gear manufacturer like Cincinnati Gear. And combine the economic advantages that result from our efficient production and consistent top quality with the *ease-of-mind* that results from our traditionally top-notch *service*, and you'll understand why so many firms (firms who recognize "do it yourself" for what it is) depend on us year after year for all their custom gear requirements.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
Fifty Years of "Gears—Good Gears Only"



PLANERS, Double Housing and Openside
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Consolidated Mch. Tool Div., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati, Ohio
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTICS AND PLASTIC PRODUCTS
Dow Chemical Co., Midland, Mich.
Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Gisholt Mch. Co., Madison, Wis.
U. S. Steel Corp., Nat'l Tube Div., Pittsburgh, Pa.

PRESS BRAKES—See Brakes, Presses and Bending

PRESS FEEDERS, Automatic
Bliss Co., E. W., Canton, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Producto Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.
U. S. Tool Co., East Orange, N. J.

PRESS STACKERS and STORAGE SHUTTLES
Michigan Production Eng. Co., Hazel Park, Mich.

PRESSES, Arbor
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
du Mont Corp., Greenfield, Mass.
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.
Logansport Machine Co., Inc., Logansport, Ind.
Threadwell Tap & Die Corp., 16 Arch St., Greenfield, Mass.
Watson-Stillman Co., Roselle, N. J.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Assembling
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio
Colonial Broach & Machine Co., Box 37, Detroit 13, Mich.
Detroit Broach Co., Inc., 950 S. Rochester Rd., Rochester, Mich.
Erie Foundry Co., 1253 W. 12th St., Erie 6, Pa.
Federal Press Co., 511 Division St., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo, N. Y.

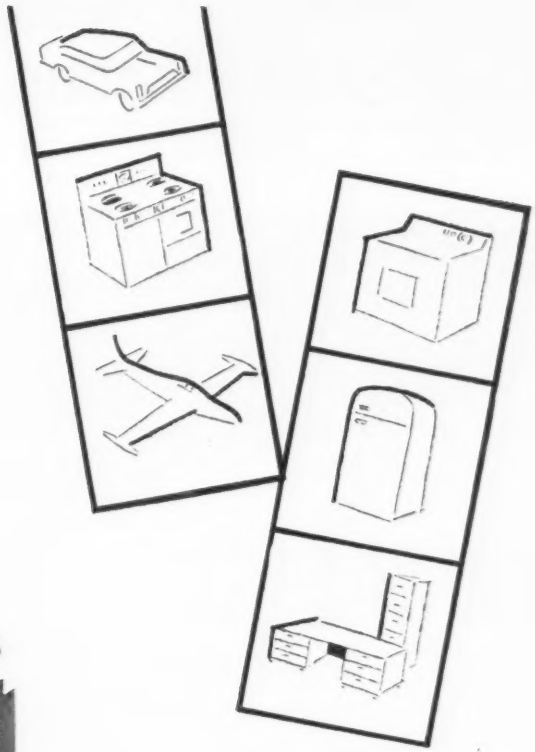
PRESSES, Blanking, Stamping
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bath, Cyril Co., 32324 Solon Rd., Solon, Ohio
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio
Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
Federal Machine & Welder Co., 1745 Overland Ave. N. E., Warren, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
U. S. Tool Co., Inc., 255 N. 18th St., East Orange, N. J.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

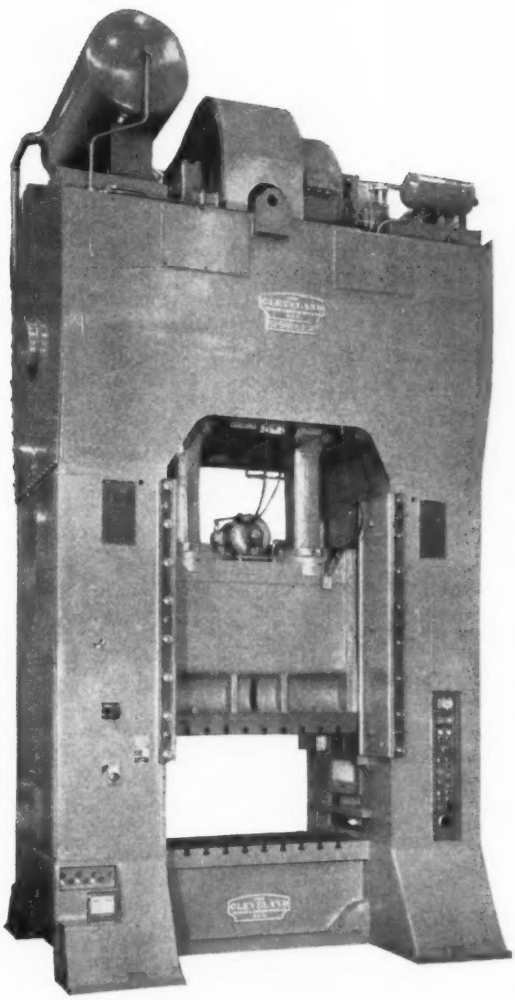
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Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engineering Corp. 470 Woodward Ave., Buffalo 17, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

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Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
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Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Erie Foundry Co., 1253 W. 12th St., Erie 6, Pa.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engineering Corp. 470 Woodward Ave., Buffalo 17, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Arcade, N. Y.

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Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Johnson Machine & Press Corp. 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Arcade, N. Y.

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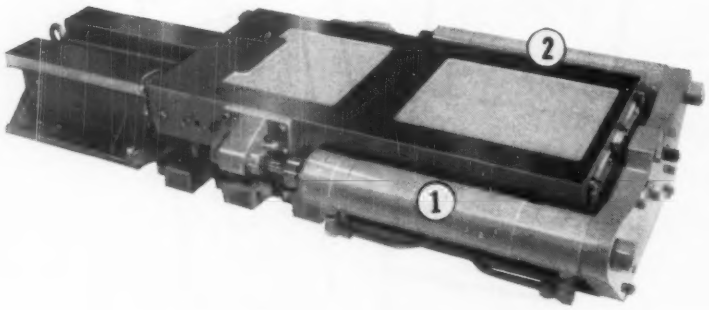
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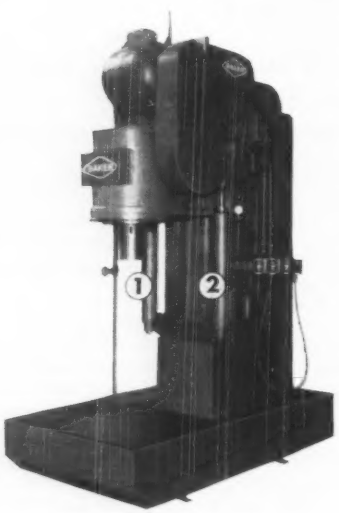
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Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.
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Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio
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Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
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Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

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Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wales-Strippet Co., 345 Payne Ave., N. Tonawanda, N. Y.
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Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
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Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.
Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
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Lake Erie Engineering Corp., 470 Woodward Ave., Buffalo 17, N. Y.
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Wiedemann Machine Co., 4272 Wissahicken Ave., Philadelphia, 32, Pa.
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Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
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Viking Pump Co., Cedar Falls, Iowa

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Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio
Hydraulic Press Mfg. Div., Mount Gilead, Ohio
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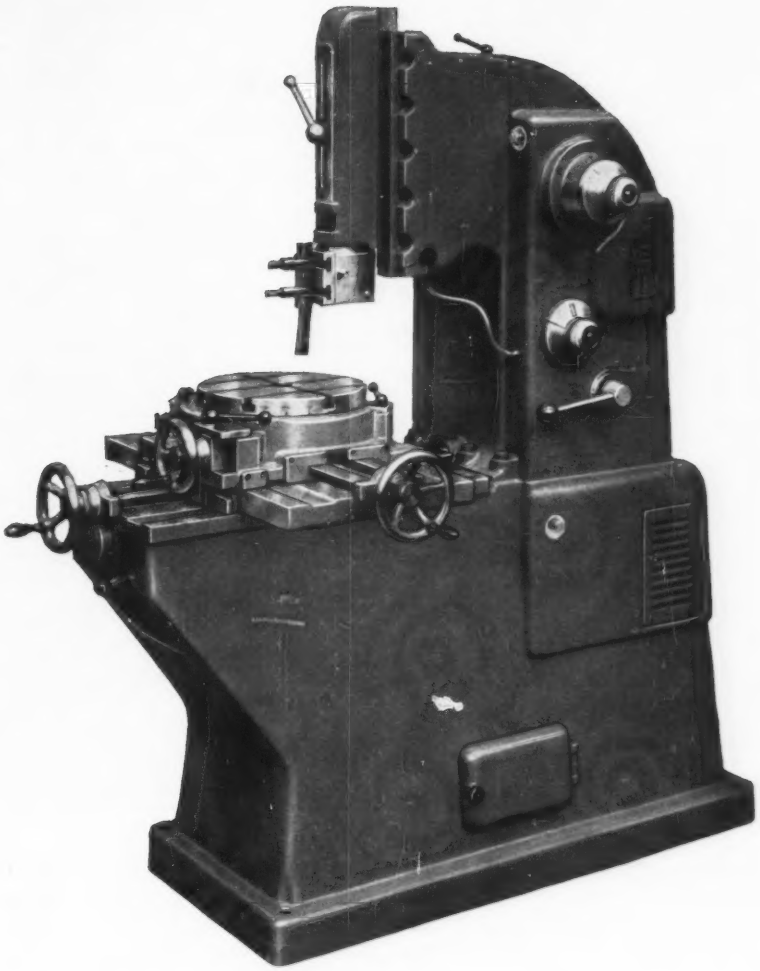
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(Continued on page 376)

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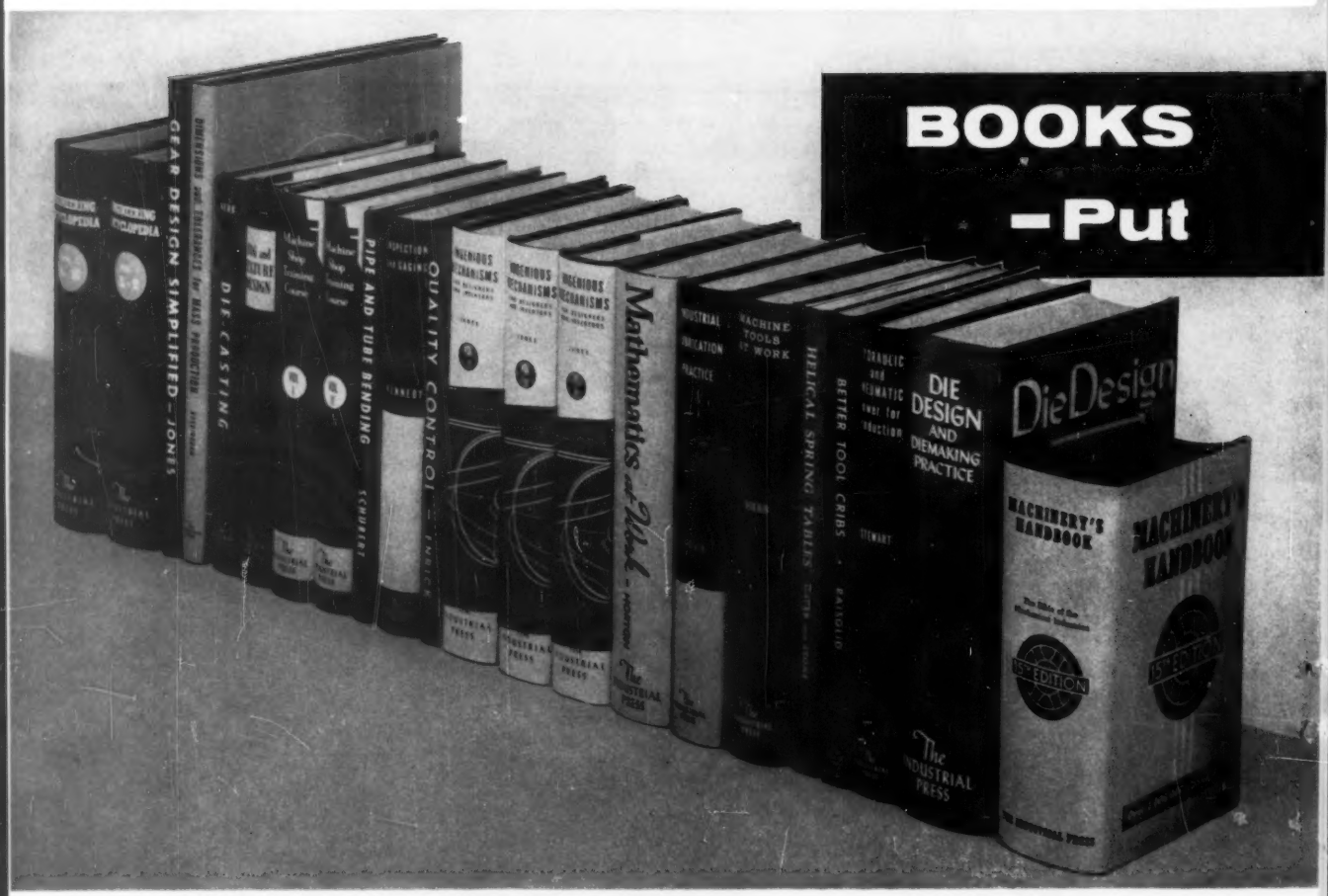
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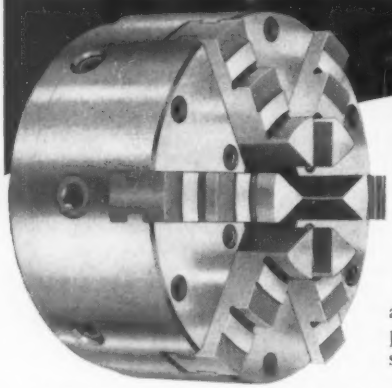
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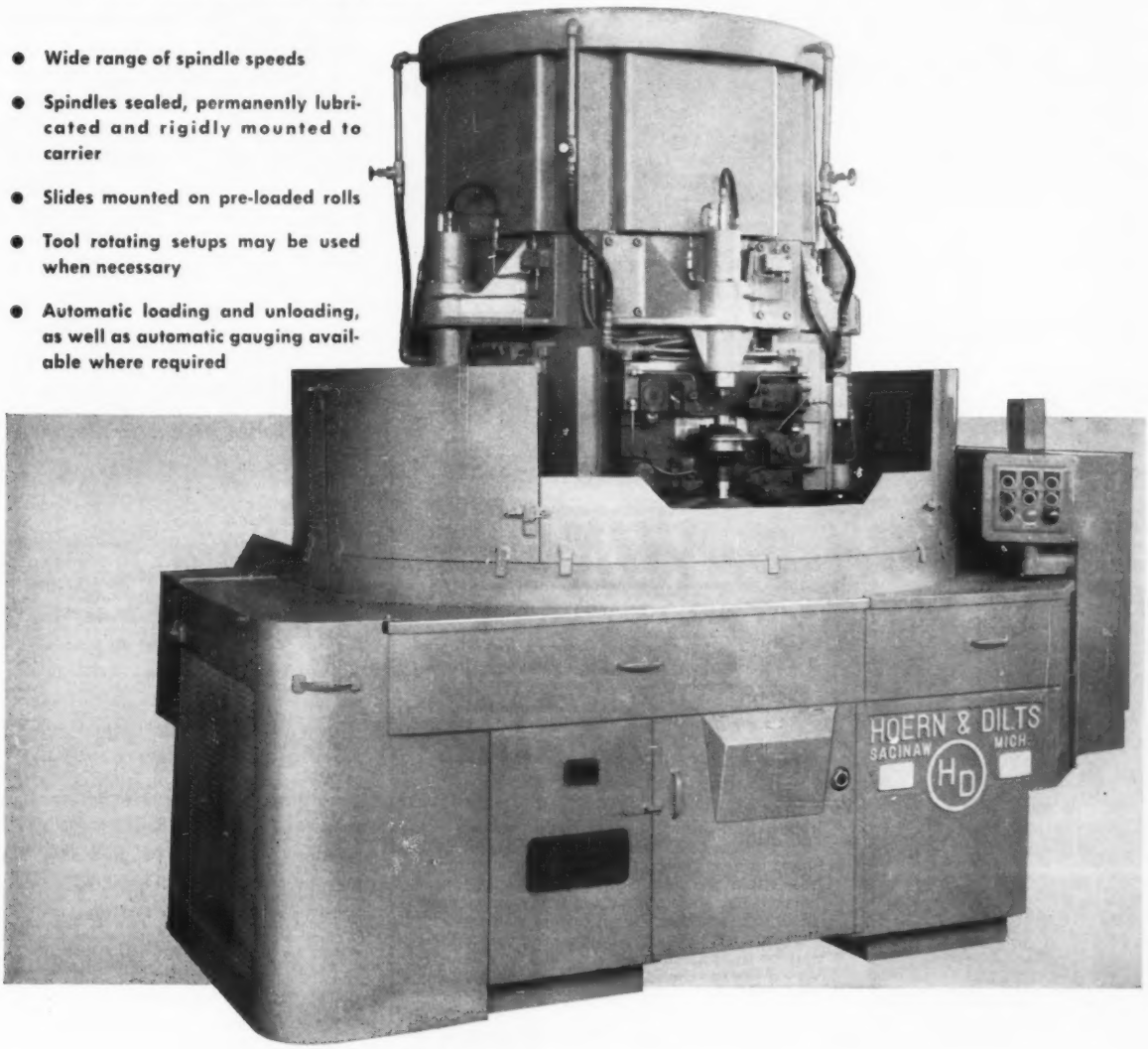
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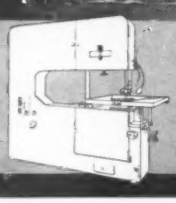
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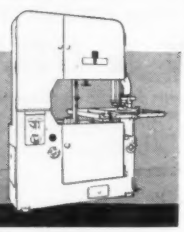
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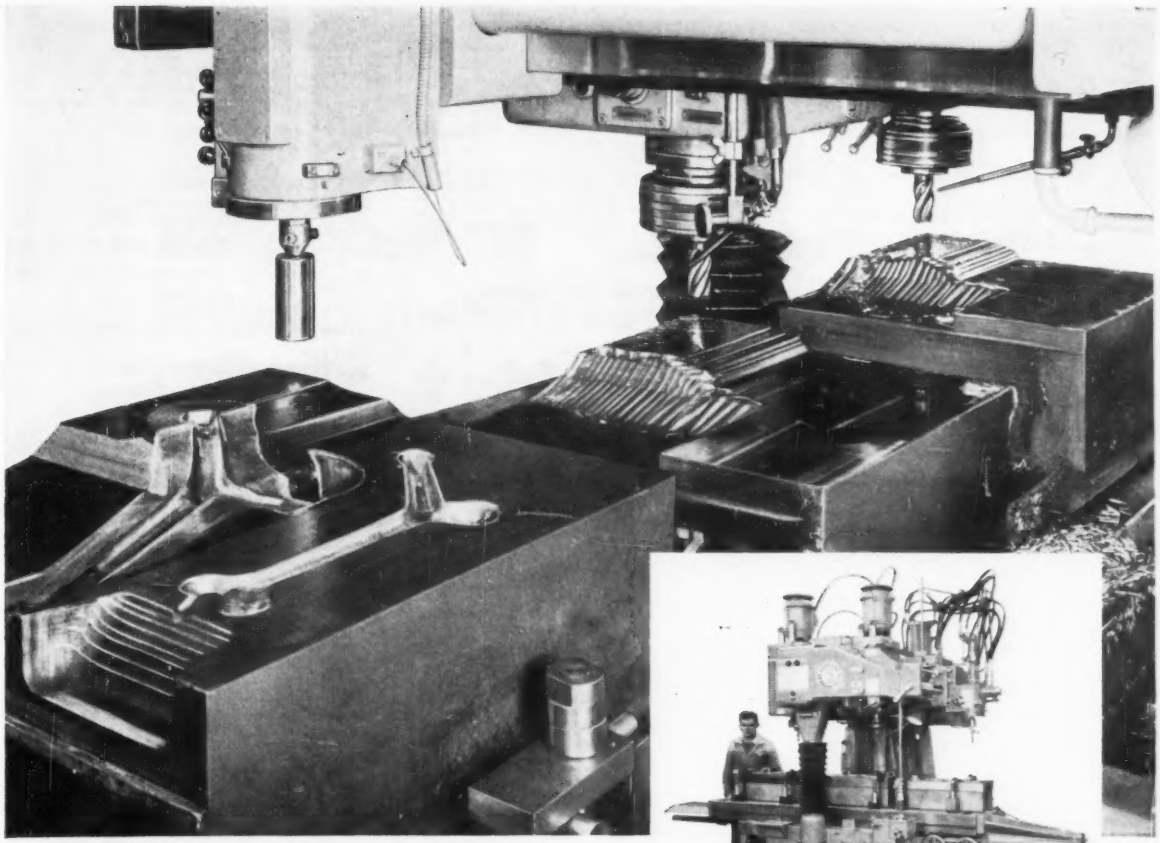


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American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bridgeport Brass Co., Bridgeport, Conn.
New Jersey Zinc Co., 160 Front St., New York N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

STRUCTURAL SHAPES
Bethlehem Steel Co., Bethlehem, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., 525 Wm. Penn Pl., Pittsburgh 30, Pa.

STUD SETTERS—See Screwdrivers, etc.

SUPERFINISHING EQUIPMENT
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Challenge Mchy. Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., Des Plaines, Ill.
South Bend Lathe Wks., South Bend 22, Ind.

SWITCHES, Limit
Allen-Bradley Co., 1331 So. 1st St., Milwaukee, Wis.

TACHOMETERS—See Indicators, Speed

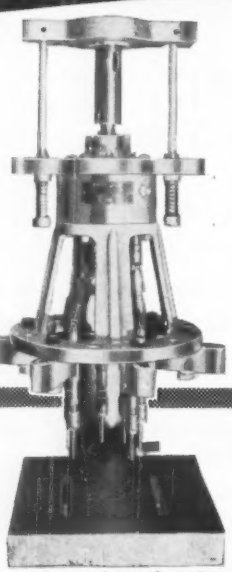
TAP HOLDERS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cleveland Automatic Mch. Co., 4932 Beech St., Cincinnati 12, Ohio
Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Michigan Drill Head Co., Van Dyke, Mich.
National Automatic Tool Co., S. 7th - N Sts., Richmond, Ind.
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Davis Boring Tool Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
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Homestrand, Inc., Larchmont, N. Y.
LaSalle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.
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Millholland Mchy. Co., W.K.M., Indianapolis 20, Ind.
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Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
Zagar Co., 24000 Lakeland Blvd., Cleveland 23, Ohio

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Chicago Pneumatic Tool Co., New York 17, N. Y.
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Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Govro-Nelson Co., 1931 Antoinette St., Detroit 8, Mich.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
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Max. Pattern 5¼"

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Min. centers 1¼"
Max. Pattern 8"

LESS THAN ½ MINUTE TO CHANGE HEAD FROM DRILLING TO TAPPING OR TAPPING TO DRILLING

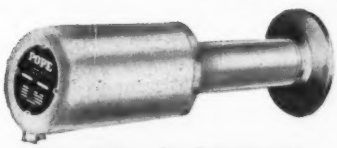
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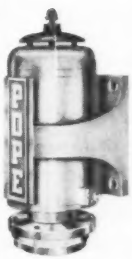
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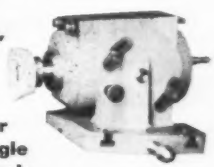
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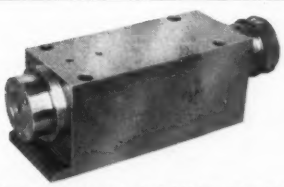


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Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio
Western Machine Tool Works, Holland, Mich.
Zagar Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

TAPS, Collapsing

Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

THREAD CUTTING MACHINES

Coulter, James Machine Co., Bridgeport 5, Conn.
Davis & Thompson Co., 4460 W. 124th St., Milwaukee 10, Wis.
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Errington Mach. Lab. Inc., 24 Norwood Ave., Staten Island 4, N. Y.
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Landis Mch. Co., Waynesboro, Pa.
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THREAD ROLLING DIES—See Dies, Thread Rolling

THREAD ROLLING EQUIPMENT

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Landis Machine Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland 3, Ohio
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Sheffield Corp., Dayton 1, Ohio

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Scully-Jones Co., 1906 S. Rockwell St., Chicago 8, Ill.

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Bridgeport Mches, Inc., 500 Lindley St., Bridgeport 6, Conn.
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Burg Tool Mfg. Co. Inc., Gardena, Calif.
Cleveland Automatic Mch. Co., 4932 Beech St., Cincinnati 12, Ohio
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Eastern Mch. Screw Corp., Truman & Barclay Sts., New Haven 6, Conn.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Lovejoy Tool Co., Inc., Springfield, Vt.
Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio
R & L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
Vascoloy-Ramet Corp., North Chicago, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Haynes Stellite Co., 725 So. Lindsay St., Kokomo, Ind.
Lovejoy Tool Co., Inc., Springfield, Vt.
Vascoloy-Ramet Corp., North Chicago, Ill.

TOOL MATERIAL, Cemented Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 30, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Metal Carbides Corp., Youngstown 12, Ohio
Spiral Step Tool Co., Chicago 25, Ill.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL MATERIAL, Ceramic

Metal Carbides Corp., Youngstown 12, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.

TOOL MATERIAL, High-Speed Steel

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Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 30, Ill.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
du Mont Corp., 289 Wells St., Greenfield, Mass.
Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 30, Mich.
Lovejoy Tool Co., Inc., Springfield, Vt.
Spiral Step Tool Co., 5400 N. Damen Ave., Chicago 25, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

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Atlas Press Co., Kalamazoo, Mich.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
Sidney Mch. Tool Co., Sidney, Ohio
Wales-Strippit Co., N. Tonawanda, N. Y.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio

TRANSFER MACHINES, Automatic—See Multiple-Station Machines

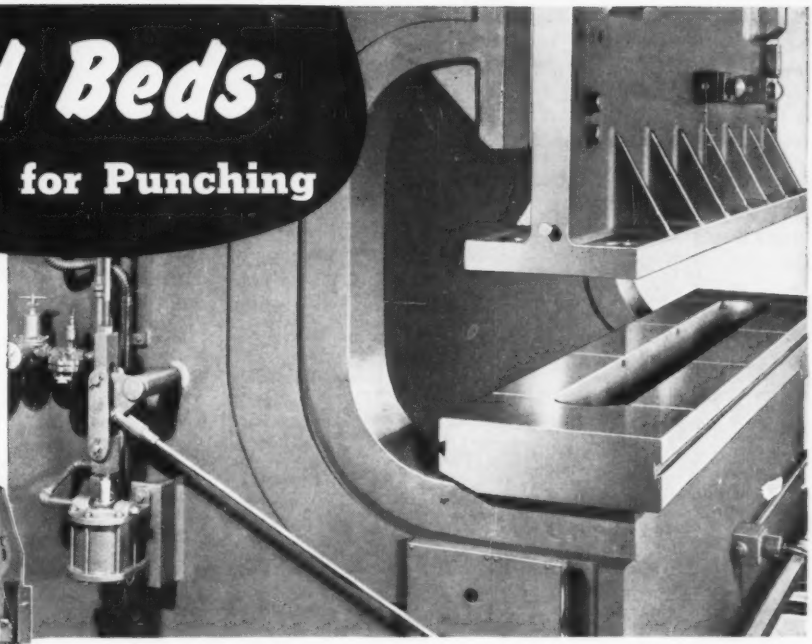
TRANSMISSION, Variable Speed

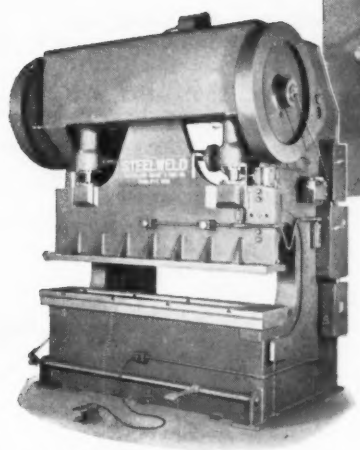
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Barnes, John S. Corp., Rockford, Ill.
Boston Gear Wks., Quincy, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, Ohio
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio
Vickers, Inc., Detroit 32, Mich.

TRUCKS, Material Handling

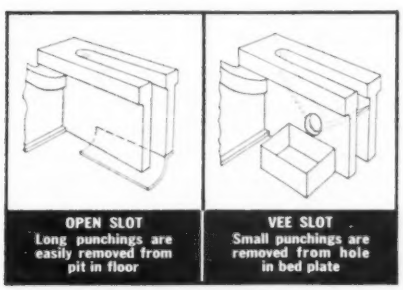
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Mueller Brass Co., Port Huron 34, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.
Ryerson & Son, Inc., Jos. T., 2558 W. 16th St., Chicago 18, Ill.

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Babcock & Wilcox Co., Beaver Falls, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.
National Tube Div., U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Ryerson, Jos. T. & Son, 2559 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio

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Sheffield Corp., Dayton 1, Ohio

UNIT HEATERS, Electric
General Electric Co., Schenectady, N. Y.

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Barnes, John S. Corp., Rockford, Ill.
Logansport Mch. Co., Inc., Logansport, Ind.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.
Vickers, Inc., Detroit 32, Mich.

VALVES, Air
Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.
Mead Specialties Co. 4114 N. Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich.

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Elmes Eng. Div., Paddock Rd. & Tennessee Ave., Cincinnati, Ohio
Hunt, C. B., & Son, 1911 E. Pershing St., Salem, Ohio
Hydraulic Press Mfg. Div., Mount Gilead, Ohio
Logansport Machine, Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Roselle, N. J.

VERNIERS—See Calipers, Vernier; Gages, Vernier

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Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Modern Mch. Tool Co., 2005 Losey Ave., Jackson, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Hghts. Blvd., Detroit 20, Mich.

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Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio
Linde Air Products Co., New York 17, N. Y.

WELDING EQUIPMENT, Gas
Linde Air Products Co., New York 17, N. Y.

WELDING EQUIPMENT, Resistance
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Federal Mch. & Welder Co., Warren, Ohio

WELDING POSITIONERS
Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.

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Bliss, E. W., Co., Canton, Ohio
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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Scott Paper Co., Chester, Pa.

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Carpenter Steel Co., 105 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.
U. S. Steel Corp., (American Steel & Wire Co. Div., Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co., Div.) 436 7th Ave., Pittsburgh, Pa.

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Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.
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Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Greaves Mch. Tool Div., 2011 Eastern Ave., Cincinnati 2, Ohio
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.
Pope Mchry. Corp., Haverhill, Mass.

WRENCHES, Allen, End, Socket, Adjustable, etc.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago Pneumatic Tool Co., New York 17, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.



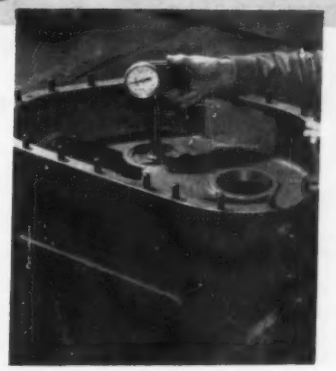
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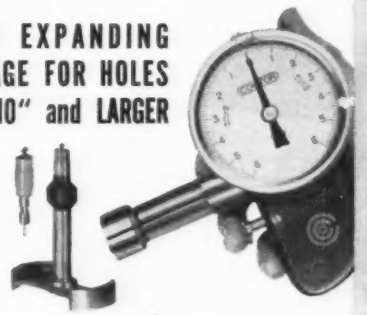


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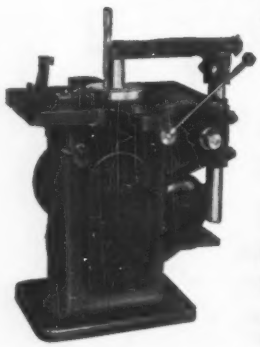


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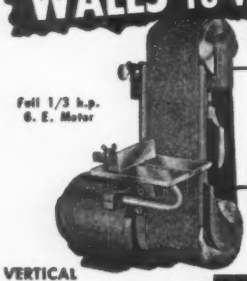
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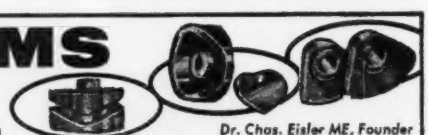
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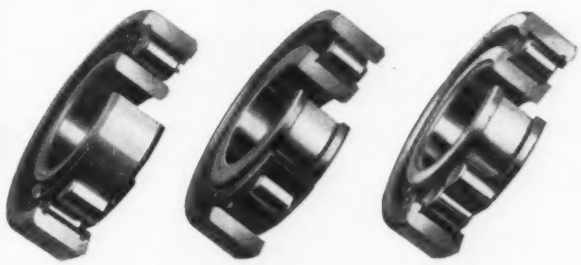


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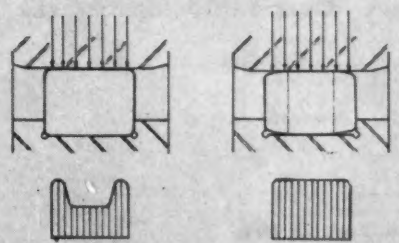
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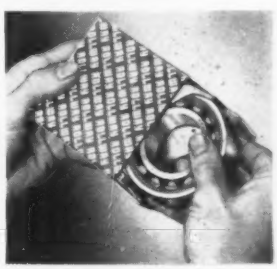
Comparative Stress Patterns under Uniform Loads for Straight and Crowned Cylindrical Rollers



Stress pattern for a straight cylindrical roller under load. Note uneven end-loading.

Stress pattern for crowned roller under load. Crowning radius is exaggerated for clarity.

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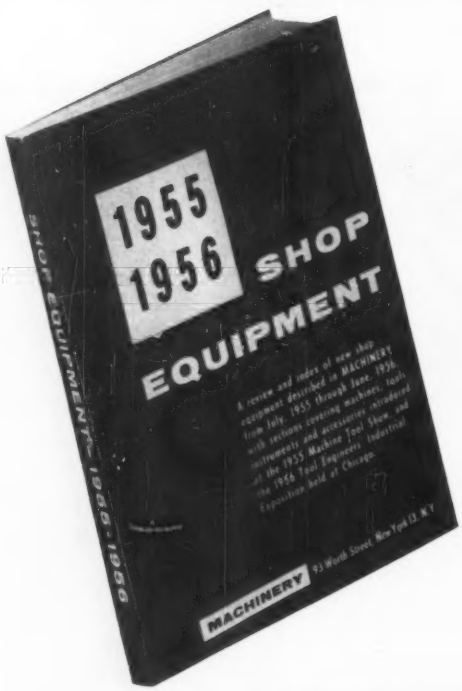
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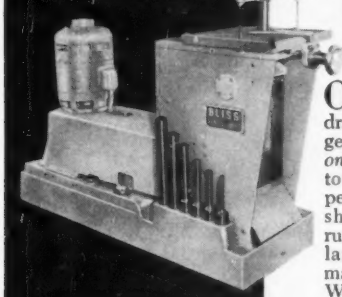
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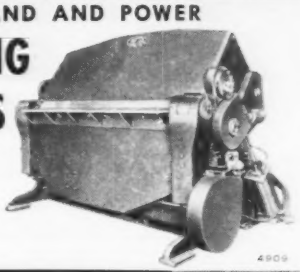
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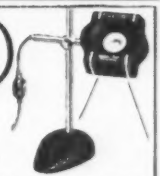
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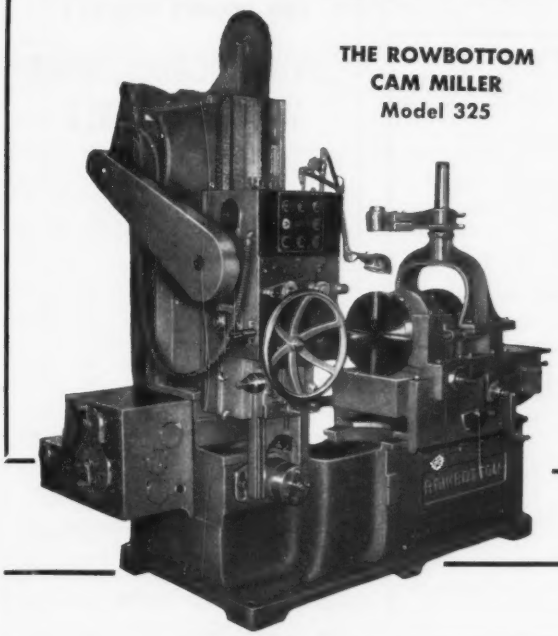
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No. 2F Foster Fastermatic, m.d., Timken
No. 2L Gisholt Universal, m.d., latest type, 1945
No. 3 Warner & Swasey Universal Ram Type, m.d.
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d.
No. 3 Jones & Lamson, m.d., 1943
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No. 4 Midland Universal Ram Type, m.d.
No. 4 Warner & Swasey, cone, bar and chucking types
No. 4A Warner & Swasey Universal, m.d., chucking, 1939
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Strokes per minute	16

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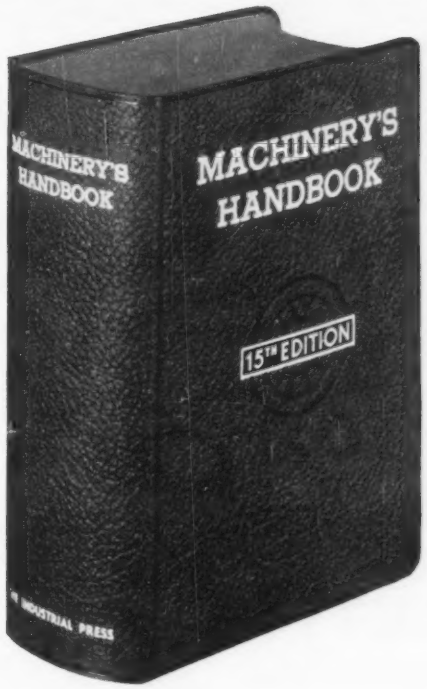
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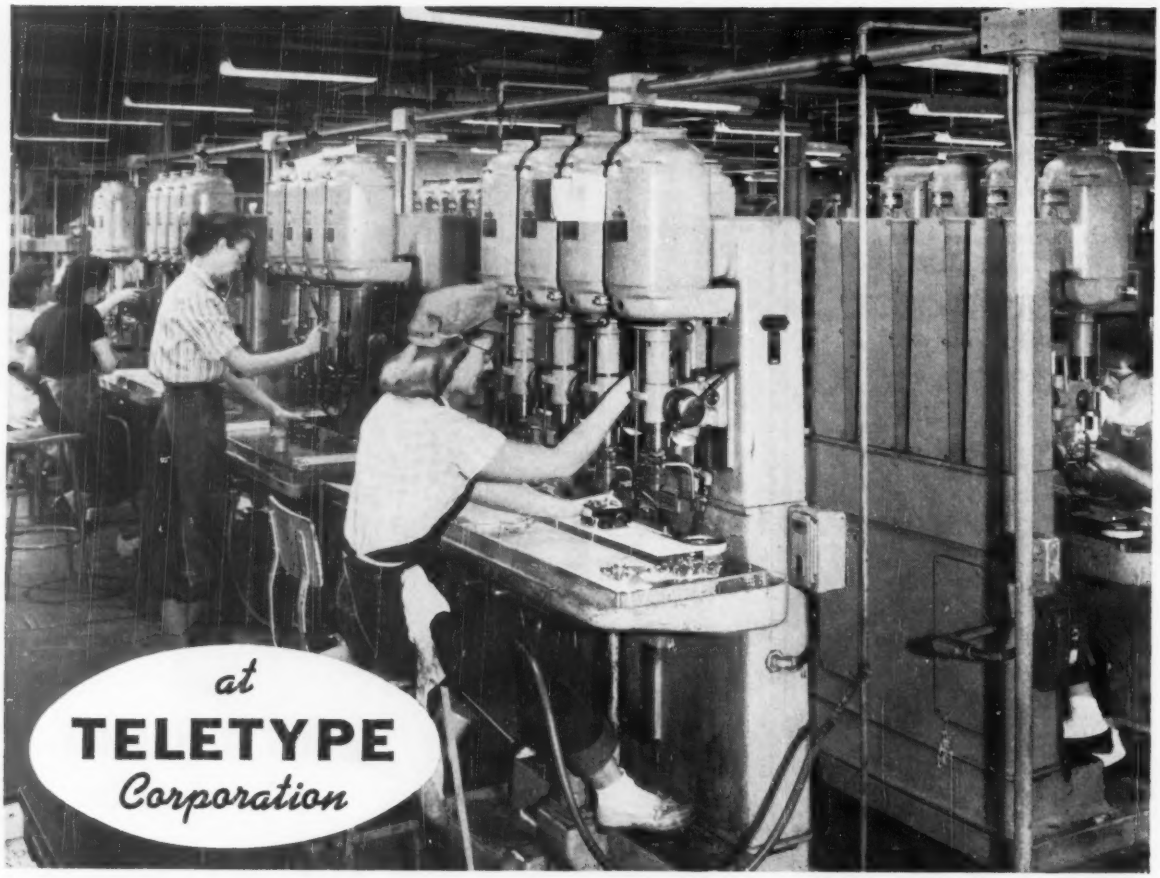
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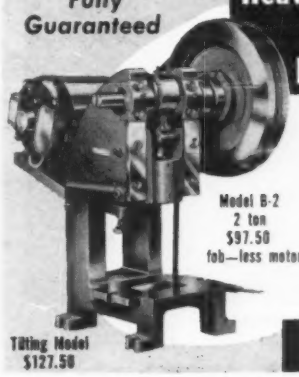


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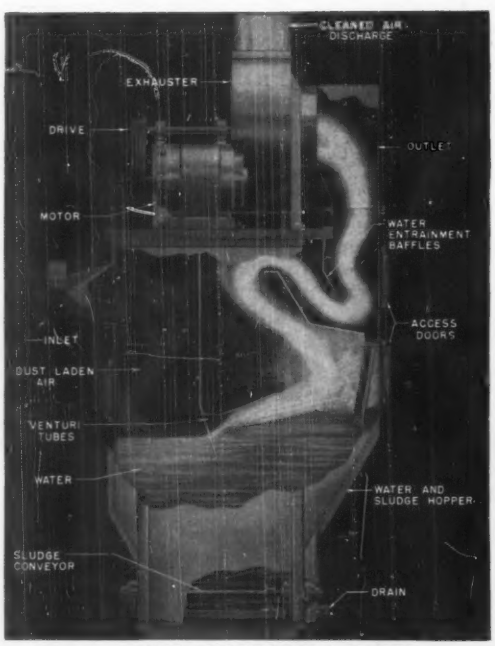
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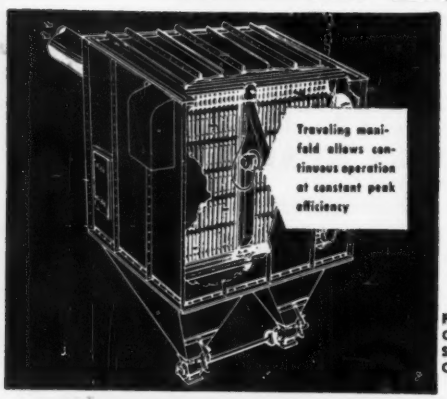
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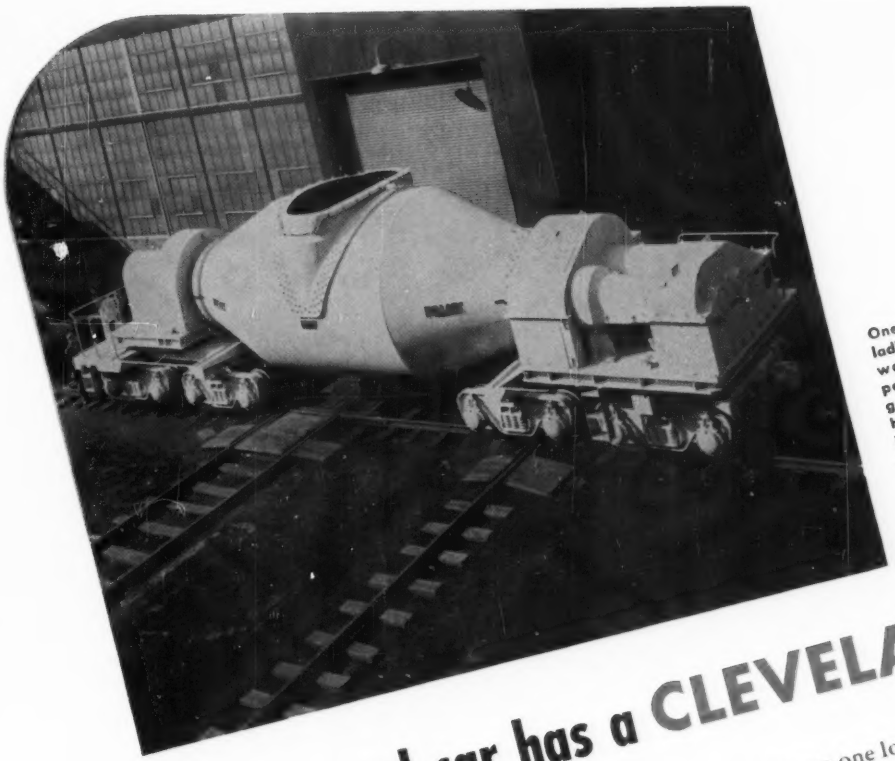
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